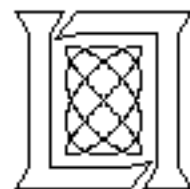# Integrated Terminal Weather System (ITWS)
Display Description

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ACKNOWLEDGMENT

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LIST OF ACRONYMS

AP	Anomalous Propagation
ARENA	AREa Noted for Attention
ARP	Airport Reference Point
ARTCC	Air Route Traffic Control Center
ASR	Airport Surveillance Radar
ATCT	Air Traffic Control Tower
ATIS	Automatic Terminal Information Service
COTS	Commercial Off-the-Shelf
DAL	Dallas-Love International Airport
DFU	Display Functional Unit
DFW	Dallas-Ft. Worth International Airport
FAA	Federal Aviation Administration
GUI	Graphical User Interface
GWI	Graphics window interaction
ITWS	Integrated Terminal Weather System
LGA	LaGuardia International Airport
LLWAS	Low Level Wind Shear Alert System
MBA/WSA OTS	Microburst Alert and Wind Shear Alert Out of Service
MDT	Maintenance Data Terminal
NDI	Non-developmental Item
NWS	National Weather Service
PDOM	Product Display Operational Mode
PG	Product Generator
PIREP	Pilot report
RBDT	Ribbon Display Terminal
SD	Situation Display
SSE	System Status Element
TDWR	Terminal Doppler Weather Radar
TRACON	Terminal Radar Approach Control
UTC	Coordinated Universal Time

1 INTRODUCTION

1.1 Scope

This Display Description provides requirements for the Integrated Terminal Weather System (ITWS) Situation Display (SD) and Ribbon Display Terminal (RBDT) when the displays are operating in one of the three Product Display Operational modes defined for the ITWS. The requirements presented herein address the appearance of the ITWS products on the SD, the ways in which the end-user can interact with the products and control product presentation, and the handling of RBDT messages and alerts. Other than the requirements specified in Section 3.7.2 and 3.7.2.1, Display Support Functions of the ITWS SD and the behavior of the SD when performing the activities associated with the Product Display Maintenance Mode are outside the scope of this document (see FAA-E-2900).

This Display Description is intended to be used in conjunction with the Integrated Terminal Weather System (ITWS) Algorithm Description (DOT/FAA/ND-95/11). The SD will construct the ITWS end-user graphics images, text and alert products using the data made available to the SD from the Government furnished ITWS product generation algorithms as defined in DOT/FAA/ND-95/11.

1.2 Background

1.2.1 System Overview

The ITWS is a fully automated system which is designed to improve the safety, efficiency, and capacity of terminal area aviation operations. The ITWS will acquire data from Federal Aviation Administration (FAA) and National Weather Service (NWS) sensors, as well as from aircraft in flight, and will provide aviation-oriented weather products that are usable by air traffic personnel in Air Traffic Control Towers (ATCT), Terminal Radar Approach Control (TRACON) rooms, ATCT and Air Route Traffic Control Center (ARTCC) Traffic Management Units, and meteorologists in Center Weather Service Units without requiring further meteorological interpretation. The initial suite of products includes current terminal area weather conditions and short-term predictions of significant weather phenomena.

1.2.2 ITWS Products

The ITWS products that are to be displayed on an SD or RBDT are indicated below. For the purposes of this document the ITWS products are divided into four categories: the runway configuration product, alert products, graphics products, and text products.

1.2.2.1 Runway Configuration Product

Runway Configuration Product (Sections 3.7.4 and 3.11.6)

1.2.2.2 Alert Products

The Alert Products are listed below and discussed in Section 3.9.

Wind Shear: Timers: Microburst Alert ATIS
Wind Shear: Timers: Wind Shear Alert ATIS

Wind Shear: Timers: Gust Front Impact
Tornado: Alert
Airport Lightning Warning
ASR-9 Anomalous Propagation (AP): AP Alert

1.2.2.3 Graphics Products

The ITWS Graphic Products are listed below and discussed in Section 3.10.

Precipitation: 5 nm Range, TRACON Range, 100 nm Range, 200 nm Range
Storm Motion and Extrapolated Position: 5 nm Range, TRACON Range, 100 nm Range,
  200 nm Range
Wind Shear: Microburst Detection/Prediction
Wind Shear: Gust Front Detection and Forecast
Gust Front Wind Shift Estimate
ASR-9 Anomalous Propagation (AP): Precipitation with AP Flagged
Tornado: Detection
Wind Shear: Ribbon Display Alerts (colored runways and corridors)

1.2.2.4 Text Products

The ITWS Text Products are listed below and discussed in Section 3.11.

Wind Shear: Ribbon Display Alerts
Terminal Winds: Wind Profile
Terminal Weather Text Message: Text
Storm Cell Information: 5 nm Range, TRACON Range, 100 nm Range, 200 nm Range

1.3 Configuration Concept

For each ITWS, there is one (1) Product Generator (PG). An ITWS PG - and only one PG - is associated with a particular TRACON. Because a TRACON may serve multiple airports, so might an ITWS PG; each airport so served is considered to be an ITWS Airport. An example of the relationship between ITWS Airports and ITWS PGs appears in Figure 1-1.

The ITWS products produced by the PG are divided into those that are airport-specific (e.g., Wind Shear: Ribbon Display Alerts) and those that are common to all airports covered by the PG (e.g. Precipitation: TRACON Range). This allocation is defined in DOT/FAA/ND-95/11. For each ITWS airport, the set of products to be displayed - the Airport Product Suite - includes both the airport-specific products and the common products.

The SD manages its display on an airport-by-airport basis. ATCT users have access to the Airport Product Suite defined for their airport, TRACON users have access to all products produced by the PG with which they are associated, while the ARTCC users have access to all products generated by the PGs from which they receive products. Examples of the associations between the airports (via the PGs) and the various SDs are depicted in Figure 1-1. The fact that a user is free to allocate his display space among the ITWS Airports supported by his SD is indicated in Figure 1-1 as well.

In the remainder of this document, the number of airports that an SD is configured to display is said to be the number of airports "associated with the SD."

1.4 Product Displays

1.4.1 Mission

The mission of the SD includes (but is not limited to) performing the following functions: display ITWS products, drive the RBDTs, display the status of the ITWS products, send data to the PG to support the generation of the Runway Configuration product; in the event of pilot-reported wind shear, allow the end-user to initiate Automatic Terminal Information Service (ATIS) countdown timer products; in the event of ITWS failure, display Terminal Doppler Weather Radar (TDWR) products; in the event of both ITWS failure and TDWR failure, display Low Level Wind Shear Alert System (LLWAS) products.

The RBDT will display Ribbon Display Alert messages, generate audible alarms, display Tornado Warning messages, and display the center field wind. A Ribbon Display Alert message contains the operational runway identifier and, if present, wind shear information (type of alarm, estimated loss or gain, and location of the first encounter with wind shear) and threshold winds.
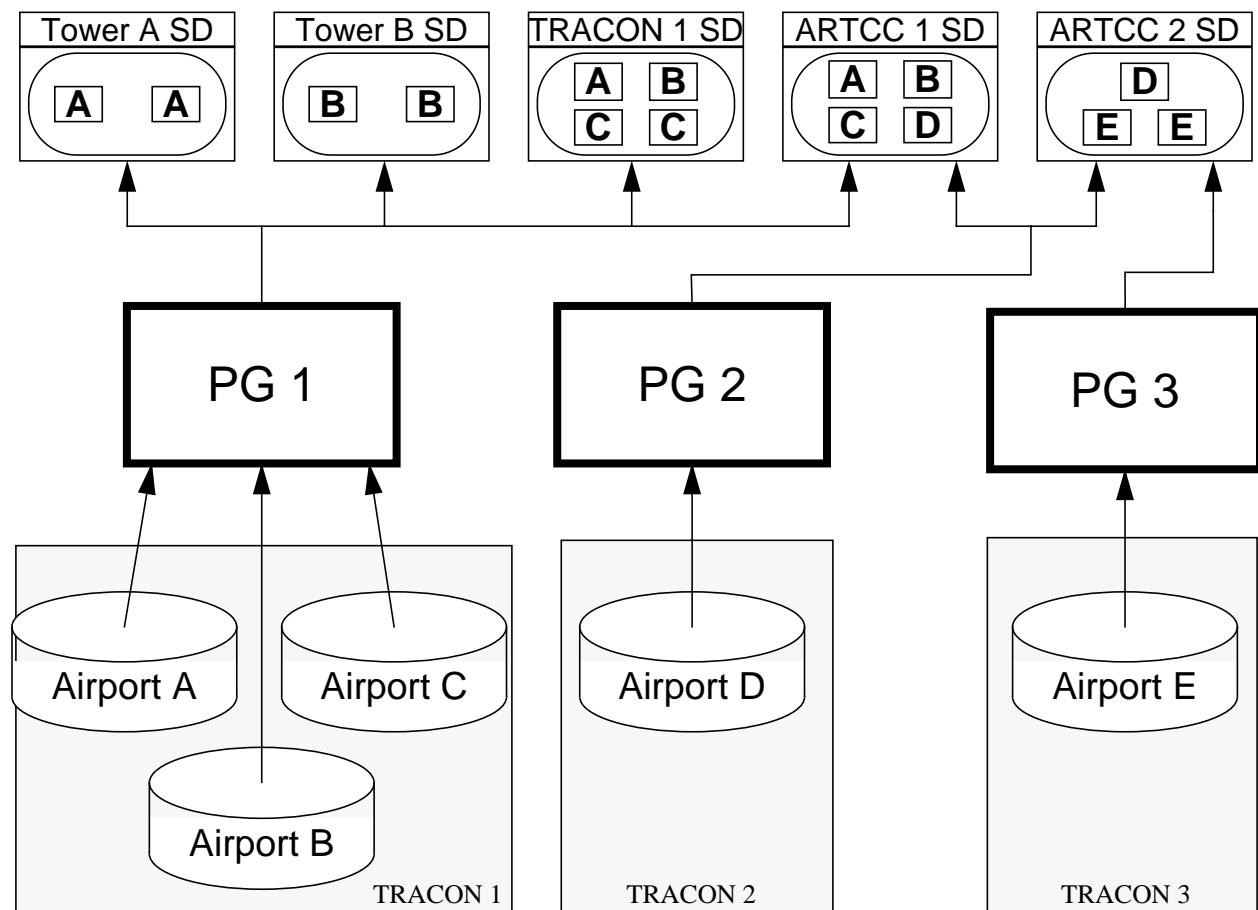
Figure 1-1. Examples of the Relationship between Airports, Product Generators, and Situation Displays.

2 APPLICABLE DOCUMENTS

FAA-E-2900 Integrated Terminal Weather System (ITWS)

DOT/FAA/ND-95/11 Integrated Terminal Weather System (ITWS) Algorithm Description

3 PRODUCT DISPLAY ITWS OPERATIONAL MODE

3.1 Pointing Device

3.1.1 Mouse/Trackball

Each SD shall have a pointing device; either a trackball or a mouse. The pointing device shall have three (3) buttons. The term "mouse" is used throughout this document but the term is not meant to imply that the pointing device must be a mouse.

3.1.2 Click the Mouse

In this document the term "click on xxx" means "move the mouse cursor to xxx and press and release a mouse button." Clicking will be accomplished with the left mouse button, except where specified otherwise in this document.

3.1.3 Response to Mouse Clicks

When the click (*i.e.*, the combination of the mouse cursor location and the specific mouse button that is pressed) constitutes one of the commands described in this document, the SD will respond by carrying out the command.

3.2 General Situation Display Requirements

3.2.1 Situation Display Response Time

The updating of the graphics windows in response to a user command (described throughout this document) while under a nominal load condition shall be completed within three (3) seconds. A nominal load condition is defined for the purposes of this requirement to be the continuous update of the upper and lower portions of the display (Section 3.3) when in the following configuration.

* The SD will be configured in single-airport format (Section 3.9).

* The SD will receive all specified products at their minimum specified intervals.

* The SD will have eight (8) graphics windows in the lower portion of the display. There will be one graphics window (large) with the dimensions 900 pixels x 720 pixels. The remaining seven (7) graphics windows will have the dimensions 200 pixels x 160 pixels.

* The graphics windows will have the Range Rings overlay displayed.

* The large graphics window will also display the Range dialog box.

If the request requires the creation of a new window, the SD shall complete the request within 10 seconds.

3.2.2 Numerical Display

Numbers shall be displayed in accordance with Appendix A.

3.2.3 Uninterrupted Screen Update

Updating of the display shall proceed uninterrupted by any user or system interaction, except as specified in Section 3.7.3.1.

3.2.4 Dialog Boxes

Dialog boxes and buttons will be the only means by which the user may interact with the SD in the Product Display ITWS, TDWR, and LLWAS Operational modes, except for product interactions in graphics windows.

3.2.4.1 Minimum Requirements

Throughout this document, text is specified for buttons. Where the phrase "button labelled" is used, the associated text will appear directly on the button.

Each dialog box shall have a title. Many, but not all, dialog boxes have descriptive text beneath the title, which indicates an action the user may take. Descriptive text, provided in Appendix D, should be used. [shall removed]

Except for the confirmation (Section 3.2.8) and StmExP/StmMot (Section 3.10.3.3.3.3) dialog boxes, each dialog box shall have a button labelled "Close".

Dialog boxes that are associated with buttons in the protected area (Section 3.3.1.3) shall be displayed with their top edges at the top of the lower portion of the screen (Section 3.3.1.2). With the exception of the StmExP/StmMot dialog box, the dialog box shall be centered horizontally with respect to the button in the protected region with which it is associated, except where bounded by the edges of the screen.

If a dialog box is displayed as a result of a click on a button in a graphics window (Section 3.4), it shall be located such that it appears to be attached to that graphics window. If the graphics window is resized or repositioned, the dialog box shall also be repositioned accordingly, except where bounded by the edges of the screen.

3.2.4.2 User Interaction

If the user clicks on the Close button, the dialog box shall disappear and no other action shall be taken. Otherwise, except for the StmExP/StmMot dialog box (Section 3.10.3.3.3), the dialog box shall close automatically 30 seconds after the last user interaction with the box and no other action shall be taken. When the user interaction is with the StmExP/StmMot dialog box, the user interaction shall cause the automatic timeout to be reset to 30 seconds for whichever of the StmExP or StmMot dialog boxes is displayed and is unobscured by the other. The requirement to reset the automatic timeout for one of the two dialog boxes is not intended to preclude resetting the automatic timeout for both the StmExP and the StmMot dialog boxes. User interaction includes, but is not necessarily limited to, the initial display of the dialog box, movement of the mouse while the cursor is positioned over the dialog box, selection of buttons in the dialog box, and moving a dialog box to the front. If a user clicks on a button associated with a dialog box that is displayed at the time of the button click, the dialog box shall be moved to the front.

The following dialog boxes shall disappear when a selection of the indicated type is made:

- the Range dialog box, upon selection of a range;
- the New Window dialog box, upon selection of the window type and (if necessary) the airport;

- the Save Window Configuration dialog box, upon entry of a filename and selection of the Save button;

- the Install Runway Configuration dialog box, upon selection of a runway configuration or the View button;

- the Runway Configuration Viewer dialog box, upon selection of the Install button;

- the Mode dialog box, upon selection of a product display operational mode or the Automatic Mode Transition button.

3.2.5 Fonts, Colors, and Dimensions

The colors and dimensions in Appendix B shall be used. The fonts in Appendix B are provided as guidance to the desired appearance of the text used in button panels, dialog boxes, graphics windows, and text product windows.

3.2.6 Commercial Off-The-Shelf/Non-Developmental Item

It is assumed that Commercial Off-The-Shelf/Non-Developmental Item (COTS/NDI) will be used for the windowing system and graphics library, in addition to the standard Operating System supplied by vendor. Maximum use should be made of the functionalities provided by these COTS/NDI systems.

3.2.7 Human-Computer Interaction

The Open Software Foundation Motif Style Guide (ISBN: 0-13-640616-5) or similar guide should be used in determining the types and layout of components used to control and interact with the SD. For example, where the term button is used in this document, any component that provides the required functionality may be used. Consistent use of a particular component should be made throughout the system. For example, if a radio button is used for a single selection, it should be used consistently for that type of selection.

3.2.8 Confirmation of User Selections

User actions that affect existing files (*e.g.,* overwriting, renaming, or deleting) or change Product Display Operational modes (Sections 3, 4, and 5) of the SD shall require confirmation of the action prior to execution. To confirm the action, the dialog box from which the action is initiated shall disappear and a confirmation dialog box shall be displayed. The title of the dialog box shall be "Confirm". The confirmation dialog box shall contain text describing the results of the action. The confirmation dialog box shall contain two (2) buttons labelled "Yes" and "No". If Yes is selected, the dialog box shall disappear and the SD shall execute the appropriate action. If No is selected, the dialog box shall disappear and no action shall be taken. If the user does not respond, the dialog box will close automatically in accordance with Section 3.2.4.2.

3.2.9 Invalid Selection

If the user performs an action for which there is no defined SD response, the SD shall display a descriptive error message in the System Status/Info window (Section 3.6).

3.3 Display Layout

3.3.1 Description

An example of the display layout is shown in Figure 3-1.

3.3.1.1 Upper Portion

The upper portion of the screen shall consist of three (3) separate sections that allow the user to customize the display, view the status of the ITWS system, and view alerts that indicate operationally significant conditions at the ITWS airports. In this document these sections will be referred to as the Display Configuration Section (Section 3.7), the Product Status Buttons section (Section 3.8), and the Alert Products Section (Section 3.9). The contents of the upper portion shall always be displayed.

3.3.1.2 Lower Portion

The lower portion of the screen shall consist of graphics windows, text product windows, and pop-up dialog boxes.

3.3.1.3 Upper Portion is Protected

The upper portion of the screen will be "protected." The user shall not be able to obscure any part of the upper portion of the screen with windows from the lower portion or dialog boxes. The protected portion of the screen shall extend from the top of the screen to the bottom of the Product Status Button Section or the bottom of the Alert Section, whichever is lower.

3.3.2 User Interaction

3.3.2.1 Window Controls

The user shall be able to manipulate the windows (where possible, using the standard controls provided by the window manager/window system selected by the Contractor) in the lower portion of the screen in the following manner; resize, move, minimize or iconify (to icon), open (from icon), create new windows, quit existing windows, and maximize (but not to cover the protected portion of screen). The aspect ratio of the data shall not change during resizing operations.

3.3.2.2 Window Icons

Each graphics window (Section 3.4) icon shall indicate the airport location code and the window's currently selected range. Each text product window (Section 3.5) icon shall indicate the airport location code and the text product associated with the text product window. The System Status/Info text window (Section 3.6) icon shall contain the text "System".

3.3.2.3 Indication of Playback and Maintenance

If the product generator or product display is playing back from archived data or the product generator is in Maintenance Mode, a cyan stripe shall be drawn across the bottom of the associated graphics and text product windows. The stripe shall contain the black text "PLAYBACK DATA" if either the product generator or the product display is playing back
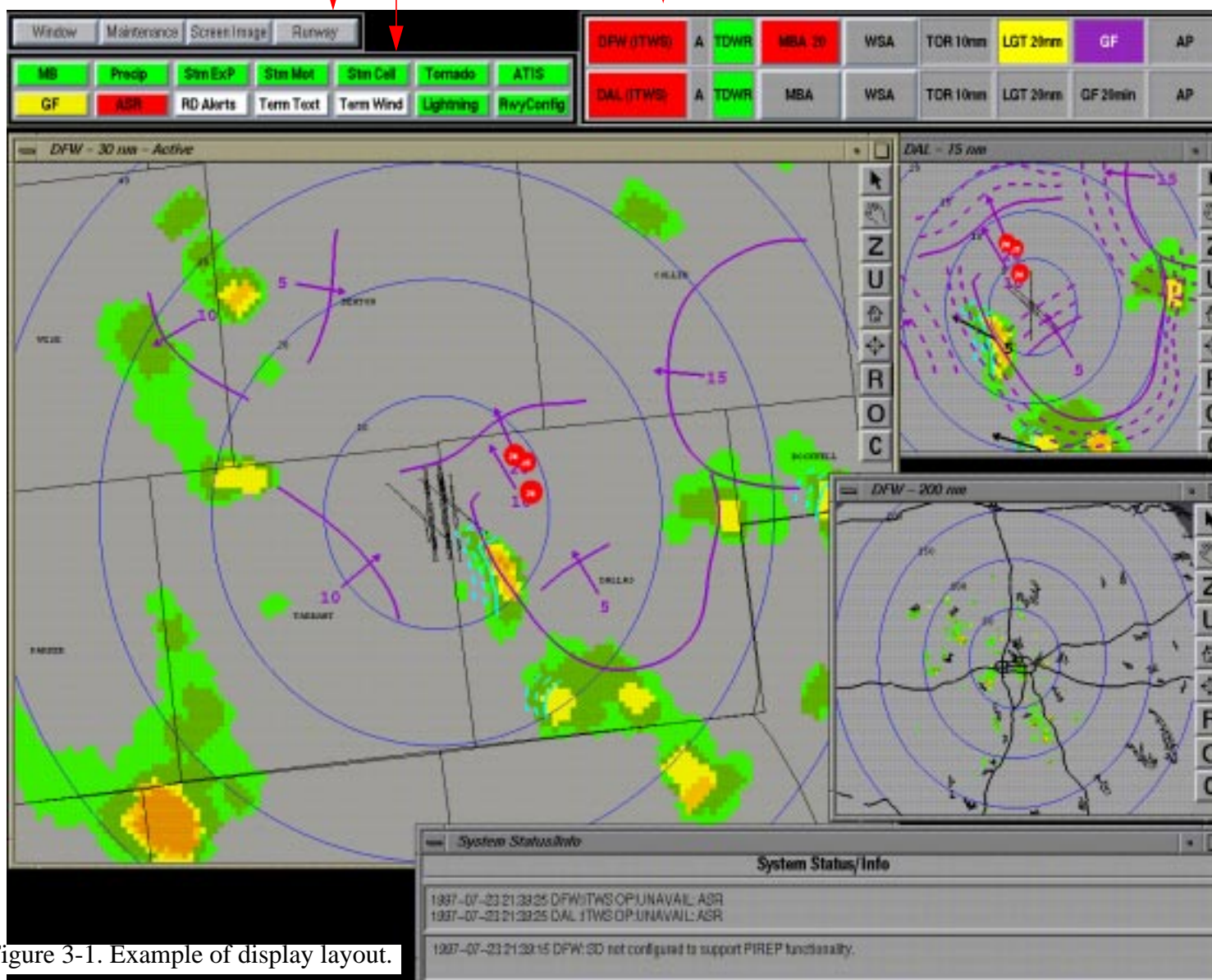
Figure 3-1. Example of display layout.

archived data. The stripe shall contain the black text "MAINTENANCE" if the product generator is in Maintenance Mode and is not playing back archived data.

3.4 Graphics Windows

3.4.1 Description

Each graphics window shall be created with reference to a specific ITWS airport. Throughout this document, these windows are described as being associated with an airport. Graphics windows shall display graphics products. The title bar of each graphics window shall contain the airport location code for the window's airport, a hyphen, and the currently selected range of the window. (Examples for Dallas-Ft. Worth (DFW), Dallas Love (DAL) and LaGuardia (LGA) International Airports include DFW - 200nm, DAL - 50nm, LGA - 5nm). The selected range will correspond to, and be synonymous with, a particular precipitation product as specified in Section 3.4.3.6 and Table 3-11. Orientation of the products (magnetic versus true north) shall be the same as the orientation of the underlying precipitation product. Zero degrees shall be the vertical display axis (top of the screen).

3.4.1.1 Active Graphics Window

There shall always be at least one (1) graphics window on the screen. There shall always be one and only one (1) active graphics window. An active graphics window allows the user to interact with the products in the graphics window and assess the status of the products via the Product Status Buttons. The user shall be able to make a different graphics window active by clicking any mouse button anywhere in the inactive graphics window. When a new graphics window is created, it shall become the active graphics window. When a graphics window becomes the active graphics window, it shall be moved to front relative to the other windows. The state (on or off) and status (available or unavailable) of the products in the active graphics window shall be reflected in the Product Status Button section (Section 3.8). The active graphics window shall have a different color title bar and icon than any other window. The title bar of the active graphics window shall have a hyphen and the word "Active" appended to the title (*e.g.,* DFW - 200nm - Active).

3.4.1.2 Inactive Graphics Window

When a window becomes inactive, the text "Active" shall be removed from the title bar (*e.g.,* DFW - 200 nm), the window shall remain open and the products shall continue to update. The color of the title bars of all windows that are not the active graphics window shall be the same.

3.4.1.3 Graphics Window Interaction Modes

The user may interact with products displayed in the graphics windows. There are three (3) graphics window interaction (GWI) modes: Product Interaction (Section 3.4.3.1), Pan (Section 3.4.3.2), and Re-center (Section 3.4.3.5).

3.4.1.4 Product Precedence and Obscuration

Items shown in the following list shall be displayed in graphics windows according to their position within the list. Items at the top of the list shall not be obscured by items further down the list. Items at the top of the list may obscure items further down the list.

1. Colorbar (Section 3.4.3.8)
2. Tornado Detection icon (Section 3.10.8.1)
3. Microburst Detection/Prediction shape (Section 3.10.4.1)
4. Gust Front Detection and Forecast lines (Section 3.10.5.1)
5. Wind Shear: Ribbon Display Alerts (Colored Runways and Corridors; Section 3.10.9)
6. Storm Cell Information indicator (Section 3.11.3.2)
7. Gust Front Wind Shift Estimate indicator (Section 3.10.6.1)
8. Storm Motion indicator (Section 3.10.3.1.1)
9. Extrapolated Position lines (3.10.3.1.2)
10. Overlays (Section 3.4.3.7)
11. Precipitation with AP Flagged (Section 3.10.7.1)
12. Precipitation (Section 3.10.2.1)

3.4.2 Default

When a graphics window is created, it shall be centered on the Airport Reference Point (ARP) of the selected ITWS airport and shall have a range equal to the maximum range of the TRACON product (denoted as TRACON range).

Whenever the center and/or range of a graphics window are changed (*e.g.,* by panning and/or zooming), data shall be drawn to the edges of the window, not to the limit of the original range.

By default each graphics window shall be in Product Interaction GWI mode (Section 3.4.3.1).

Every graphics window shall display range rings by default when the window is displayed.

All runways and all corridors associated with active runways (Section 3.10.9) for the selected ITWS airport shall be displayed by default in every graphics window associated with the airport.

3.4.3 User Interaction

There shall be nine (9) window display control buttons in the right border of every graphics window. The icon for each button should be similar to Figure 3-2.

3.4.3.1 Product Interaction GWI Mode

If the user clicks on the Product Interaction button, the mouse cursor shall look like the symbol on the button and the active window shall switch to Product Interaction mode. The mouse buttons will interact with the Storm Motion and Extrapolated Position product and Storm Cell Information product as described in Sections 3.10.3 and 3.11.3. The active window shall remain in Product Interaction GWI mode until the user switches to another GWI mode.

3.4.3.2 Pan GWI Mode

The user shall be able to pan in any graphics window. If the user clicks on the Pan button, the cursor shall look like the symbol on the button and the active graphics window shall switch to Pan GWI mode. In Pan GWI Mode, if the user presses and holds the left mouse button and moves the cursor within the active graphics window, the data shall move in the direction of the motion of the cursor. Panning shall stop when the precipitation product boundary, as defined by site-specific adaptation data, reaches the center of the graphics window. Panning shall appear to be continuous.

Product Interaction Button

Pan Button

Zoom In Button

Zoom Out Button

Home Button

Re-center Button

Range Button

Overlay Button

Colorbar Button
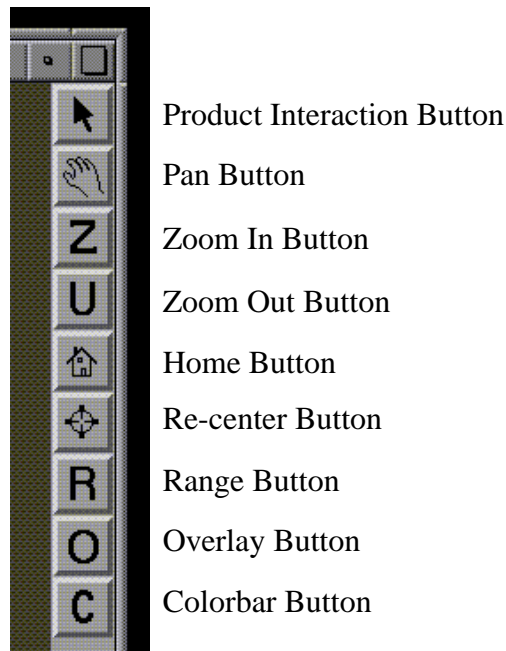
Figure 3-2. Window Display Control buttons.

The active graphics window shall remain in Pan GWI mode until the user switches to Product Interaction or Re-center GWI mode.

3.4.3.3 Zoom Buttons

The selected range (Section 3.4.3.6), and thus the precipitation product, shall remain the same as the user zooms in the graphics window. Zooming shall appear to be continuous.

3.4.3.3.1 Zoom In Button

While the user presses the Zoom In button, the data in the active graphics window shall be redrawn repeatedly such the range extent of the image becomes increasingly smaller. Zooming in shall stop when the distance from the center of the window to the nearest edge is equal to 5 nm.

3.4.3.3.2 Zoom Out Button

While the user presses the Zoom Out button, the data in the active graphics window shall be redrawn repeatedly such that the range extent of the image becomes increasingly larger. Zooming out shall stop when the distances from the center of the window to the right edge of the window and from the center of the window to the top edge of the window are such that the entire precipitation product, the boundaries of which are defined by site-specific adaptation data, would be visible if the ARP were at the center of the window.

3.4.3.4 Home Button

If the user clicks on the Home button, the active graphics window shall be re-centered on the ARP of the associated airport and shall display data out to the window's currently selected range. Clicking on the Home button shall not change the GWI mode of the active graphics window.

3.4.3.5 Re-center GWI Mode

If the user clicks on the Re-center button, the mouse cursor shall look like the Re-center button and the active graphics window shall switch to Re-center GWI mode. If the user clicks the left mouse button in the active graphics window, the data in the window shall be re-centered such that the data at the point where the user clicked is at the center of the graphics window. The active graphics window shall remain in Re-center GWI mode until the user switches to Product Interaction or Pan GWI mode.

3.4.3.6 Range Button

The user shall be able to change the range of the active graphics window. If the user clicks on the Range button, the SD shall display a dialog box with the title "Range". The dialog box shall contain buttons labelled "5 nm", "10 nm", "15 nm", "30 nm", "50 nm" (if the TRACON has more than one (1) Airport Surveillance Radar (ASR)-9), "TRACON", "100 nm", and "200 nm". The dialog box shall indicate the currently selected range of the active graphics window. If the user clicks on one of the range buttons, the currently selected range of the active graphics window shall be changed accordingly. The active graphics window shall display the Precipitation product that corresponds to the newly selected range of the window, as specified in Table 3-11, and the associated products (as configured by the user). The distance from the center of the graphics window to the nearest window edge shall be equivalent to the distance from the ARP to the selected display range option. The active graphics window shall be centered on the ARP. Any information about previous panning or zooming or re-centering will be disregarded.

3.4.3.7 Overlay Button

The SD shall be capable of displaying up to 20 overlays per airport. If the user clicks on the Overlay button, the SD shall display a multiple-selection dialog box associated with the graphics window. The title of the dialog box shall be "Overlay". The dialog box shall contain one (1) button for each overlay that is associated with the airport in the graphics window. The box shall indicate which overlays are currently being displayed in the graphics window. The user shall be able to display any or all of the overlays at once. If the user clicks on a button in the dialog box, the SD shall toggle the status of the associated overlay between on and off.

The overlays available for a specific SD shall be site-specific adaptation data.

3.4.3.7.1 Hazardous Sector Overlays

The hazardous sector overlays shall depict the perimeter of the microburst coverage region associated with a particular TDWR. If data from the associated TDWR is available to the PG for generation of the Wind Shear: Microburst Detection/Prediction product, the overlay shall be black. If data from the associated TDWR is unavailable to the PG, the overlay shall be Microburst

Red. If the Wind Shear: Microburst Detection/Prediction product is unavailable at the SD, the overlay shall be Microburst Red.

3.4.3.7.2 Range Rings

The rings shall be centered on the ARP. The spacing between the rings shall depend on the selected range of the window as indicated in Table 3-1.

The rings shall be labelled with their distance from the ARP. The labels shall appear along a radial at 315 degrees from the ARP (in the northwest direction from the airport).

3.4.3.8 Colorbar Button

There shall be a small colorbar in each graphics window indicating which colors are associated with the displayed levels of precipitation. If the user clicks on the Colorbar button, the SD shall toggle the status of the colorbar in the active graphics window between "visible" and "not visible."

Range Option	Inter-ring Spacing
5 nm	no rings
10 nm	5 nm
15 nm	5 nm
30 nm	10 nm
50 nm	10 nm
TRACON	10 nm
100 nm	25 nm
200 nm	50 nm

Table 3-1. Range ring spacing.

3.4.3.8.1 Colorbar Description

When visible, the colorbar shall contain eight (8) or nine (9) squares and zero (0) or one (1) rectangle. Seven (7) of the squares shall contain a black number (zero (0) through six (6)). When the precipitation product is not based on TDWR data, there shall be eight (8) squares. When the precipitation product is based on TDWR data, there shall be nine (9) squares; the eighth square shall be labelled "A" and shall be colored TDWR Attenuation Gray when any precipitation levels are turned on and Background Gray when all precipitation levels are turned off (Section 3.10.2.3). When the precipitation product is based on Precipitation with AP Flagged data, there shall be a

rectangle, labelled "AP", which is colored black. In all cases, the rightmost element shall be a square containing the letter "X". The square labelled "X" shall be colored No Data Gray. The square labelled "0" and squares labelled with precipitation levels that have been turned off (Section 3.10.2.3) shall be colored Background Gray. Squares labelled with precipitation levels that are turned on shall be colored with the appropriate colors from Appendix B.

3.5 Text Product Windows

3.5.1 Description

Each text product (Section 3.11) shall be displayed in a text product window that is referenced to a specific airport. When the user chooses a text product, a text product window shall be displayed and the product shall update in the window. When a product updates, the new information shall replace the old information in the window. Each text product window shall contain a Close button. Except for the Storm Cell Information text product window, text product windows shall not close automatically. There shall be at most one (1) text product window per text product per airport.

The title bar of each text product window shall contain the airport location code, a hyphen, and an identifier for the ITWS product that is displayed in the window. (*e.g.,* DFW - Terminal Winds, LGA - Ribbon Display Alerts, DAL - Storm Cell Information).

By default, the text product window shall be large enough to display the associated text product.

3.5.2 User Interaction

[shall removed][shall removed] Text product windows are intended for display of information only and do not support user interaction with the products displayed therein. Text product window shall not have scrollbars.

3.6 System Status/Info Text Window

There shall be a System Status/Info text window that conveys messages to users. The window shall be displayed by default. The text window shall contain two (2) areas. The top area shall be used for system status; the bottom area shall be used for product information and error messages. The contents of the window shall remain in the window until they have been scrolled off the window by new text. If the window is iconified, it shall be opened automatically when new information is displayed in the info area. The user shall not be able to quit the System Status/Info window. The text in the title bar of the System Status/Info window shall be "System Status/Info".

3.6.1 System Status Area

The current date, time, airport location code, and product generation mode (*e.g.,* ITWS OP, ITWS MT, TDWR OP, etc.) shall be prepended to any message displayed in the System Status area. The System Status area shall display a list of unavailable products for each airport. The list shall be displayed in the window every 15 minutes or as either the list of unavailable products or the product generation mode changes. By default, the system status area shall be large enough to display a separate line for each ITWS airport that the SD is configured to support.

3.6.2 Info Area

An alphanumeric code shall be prepended to any message displayed in the Info area. For messages that are associated with a specific airport, this code will contain the current date, time, and the airport location code. For messages that are not uniquely identified with an airport, the code will contain only the current date and time. Only product information and error messages that are relevant for use by air traffic control shall be displayed in the Info area. Error messages as specified throughout this document shall be displayed in the Info area. Upon receipt of an error message, the window shall visually alert the user, as for example, by flashing the title bar and border once. If the window is hidden or iconified on receipt of an error message, the window shall be displayed in front of other windows after which the window shall visually alert the user as, for example, by flashing the title bar and border once.

3.6.3 User Interaction

The user shall not be able to interact with the contents of the System Status/Info window. Clicking any mouse button inside the System Status/Info window shall be considered an invalid selection. The System Status/Info window shall not have scrollbars.

3.7 Display Configuration Section

The Display Configuration Section shall consist of one (1) row of four (4) buttons in the upper left corner of the display (Figure 3-1). The buttons shall be labelled (from left to right) "Window", "Maintenance", "Screen Image", and "Runway" (Figure 3-3).
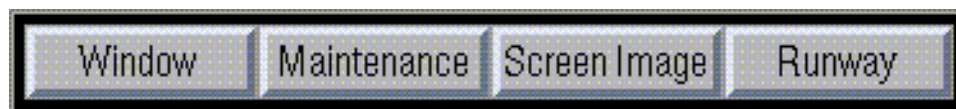
Figure 3-3. Display Configuration buttons.

3.7.1 Window

If the user clicks on the Window button, the SD shall display a dialog box with the title "Window". The dialog box shall appear with buttons labelled "New...", "Save...", "Remove...", and "Restore...".

3.7.1.1 New Window

If the user clicks the New button, the Window dialog box shall disappear and a different dialog box shall appear. The title of the dialog box shall be "New Window". The dialog box shall have a set of buttons containing the types of windows. If there is more than one airport associated with the SD, the dialog box shall contain a second set of buttons (one button for each airport associated with the SD). The types of windows shall include "Ribbon Display Alerts", "Terminal Winds", "Terminal Text", "Runway Configuration", and "Graphics". Upon selection of the window type and (if necessary) airport, the SD shall create the appropriate window.

3.7.1.2 Save Window Configuration

If the user clicks the Save button, the Window dialog box shall disappear and a different dialog box shall appear. The title of the dialog box shall be "Save Window Configuration". Because the SD may not have a keyboard, the Save Window Configuration dialog box shall have a graphics representation of a QWERTY keyboard. The dialog box shall also contain a button labelled "Save". The user shall be prompted to enter a filename for the window configuration. The user shall enter the filename by clicking on the letters with the left mouse button. If the user enters the filename and clicks the Save button, the SD shall save the window configuration. The information saved shall be the locations, sizes, airport associations, and product states (on or off) for all product display windows; overlays, range selections, and displayed precipitation levels for all graphics windows; and the identification of the active graphics window.

3.7.1.3 Remove Window Configuration

If the user clicks the Remove button, the Window dialog box shall disappear and a multiple-selection dialog box titled "Remove Window Configuration" shall appear. The dialog box shall list the saved window configurations (except for the default configurations) and shall allow the user to remove any window configuration(s) listed.

3.7.1.4 Restore Window Configuration

If the user clicks the Restore button, the Window dialog box shall disappear and a dialog box titled "Restore Window Configuration" shall appear. The box shall list the saved window configurations and allow the user to select a configuration. Upon selection, the dialog box shall disappear and the SD shall restore the requested window configuration.

3.7.1.5 Default

The SD shall start-up with the default window configuration. The default window configuration shall be site-specific adaptation data.

3.7.2 Maintenance

The button labelled "Maintenance" is used to access Display Support and Maintenance functions at the SD, both of which require a password. If the user clicks on the Maintenance button, a dialog box shall appear for password entry. Entry of passwords shall be via a graphical representation of a QWERTY keyboard at the SD.

The dialog boxes, windows, etc. used to perform Display Support and Maintenance functions at the SD are exempted from the requirements levied on the user interface elsewhere in this document, excepting requirements specified in this section and its subsection. This exemption does not pertain to the dialog boxes, windows, etc. used for performing Operational functions, regardless of whether the SD is using live data or is performing a playback from archived data.

3.7.2.1 Runway Configuration Editing

The SD shall provide a capability for editing runway configurations in the field. This capability shall also be available at the Maintenance Data Terminal (MDT).

The runway configuration editor shall meet the following requirements:

1. Password required to enter editor,
2. Ability to load or delete existing configurations and save new configurations,
3. Ability to close editor with no action,
4. Confirmation for overwriting or deleting configurations,
5. Ability to name configurations,
6. Ability to post changes from the editor (Changes do not become operational until installed from the Install Runway Configuration dialog box.),
7. Ability to identify RBDTs with names, not numbers,
8. No pull-down or walking menus,
9. Ability to define content of, and order of configurations in, the Install Runway Configuration dialog box,
10. Activation of a runway without assigning it to a RBDT is prevented.

The following requirements are associated with runway configuration management:

1. The mapping of RBDT names to RDBT device numbers shall be field-settable adaptation data.
2. Posted configurations that have not yet been installed shall be highlighted in the Install Runway Configuration dialog box and the Runway Configuration Viewer dialog box.

3.7.3 Screen Image

If the user clicks on the Screen Image button, a dialog box titled "Screen Image" shall appear. The Screen Image dialog box shall have buttons labelled "Save", "Print...", "Delete...". Process priorities shall be 1) save, 2) display update, 3) print, and 4) delete.

3.7.3.1 Save

If the user clicks on the Save button the Screen Image dialog box shall disappear and the screen image shall be saved with a filename that identifies the SD and the current date and time in Coordinated Universal Time (UTC). The screen shall not update while the image is being saved to memory. Saving the image to memory shall not take more than 10 seconds, after which the screen may update.

3.7.3.2 Print

If the user clicks on the Print button the Screen Image dialog box shall disappear and a dialog box titled "Print Image" shall appear. The Print Image dialog box shall list the saved image files. The user shall be able to print any saved image files or the current (unsaved) screen image.

3.7.3.3 Delete

If the user clicks on the Delete button the Screen Image dialog box shall disappear and a dialog box titled "Delete Image" shall appear. The Delete Image dialog box shall list the saved image files and shall allow the user to delete any saved image files.

3.7.4 Runway

The Runway button is used to view and install runway configurations. A runway configuration is the mapping of runways to RBDT lines for all RBDTs associated with a particular airport. Any given RBDT can display information for one airport only. The installation of a specific runway configuration enables the generation of runway-specific alerts for display. If the user clicks on the Runway button at an SD with exporting capability the behavior will be as described in Section 3.7.4.1. The Runway button shall be disabled on SDs without exporting capability.

3.7.4.1 Configuration Exporting

SDs as defined by field-settable adaptation data set at the Maintenance Data Terminal (MDT) shall have the ability to export and view runway configurations. These SDs are referred to as exporting SDs. The exported runway configuration information is used by the PG to support dissemination of the Runway Configuration product to the ITWS algorithms and SDs. The ability to view and export runway configurations shall exist while the SD is in any of the product display operational modes.

Within an ITWS, the capability to export configurations from more than one (1) SD at any time shall exist. However, only one (1) SD at a time shall have runway configuration control for a particular airport and thus, shall be able to export configurations for that airport. This SD is referred to as the controlling SD. Each SD that has export capability (*i.e.*, an exporting SD) shall have an associated list of airports for which runway configuration information may be exported. This airport list will be part of the field-settable adaptation data set at the MDT.

If the airport list consists of more than one airport, the Configure Airport dialog box (Section 3.7.4.2) shall appear when the user clicks on the Runway button. Otherwise, the Install Runway Configuration dialog box (Section 3.7.4.3) shall appear when the Runway button is selected.

3.7.4.2 Configure Airport Dialog Box

The Configure Airport dialog box shall contain one (1) line for each airport in the list of airports. Each line shall contain a button labelled with the airport location code followed by an ellipsis (...) and text next to the button with the identification of the SD that currently has runway configuration control for that airport. For example, in Figure 3-4 DFW TRACON controls the configuration for DFW and Love Tower controls the configuration for DAL.

Clicking on an airport shall cause the Configure Airport dialog box to disappear and the Install Runway Configuration dialog box for the selected airport shall be displayed.

3.7.4.3 Install Runway Configuration Dialog Box

The Install Runway Configuration dialog box (Figure 3-5) shall list the possible runway configurations for the specified airport. The height of the single-column dialog box shall be determined by the number of configurations in it. The maximum height of the dialog box shall be equal to the distance from the bottom of the protected area to the bottom of the display. The width of the dialog box shall be large enough to accommodate the configuration names. The identifiers used for the configurations shall be descriptive alphanumeric text. The dialog box shall not scrollable, thus the maximum number of configurations that can be displayed in the dialog box is determined by the maximum height of the dialog box. The maximum number of configurations

Figure 3-4. Configure Airport dialog box.

shall be site-specific adaptation data. The dialog box shall indicate which runway configuration is currently in effect.
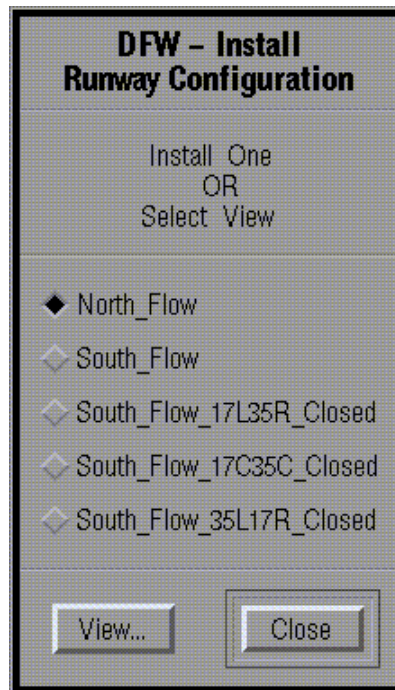
Figure 3-5. Install Runway Configuration dialog box.

If the user clicks on a runway configuration and the SD does not control the configuration for that airport, a confirmation dialog box (Section 3.7.4.5) shall appear. If the user clicks on a runway configuration and the SD controls the configuration for that airport, Section 3.7.4.6 will apply.

The Install Runway Configuration dialog box shall also contain a button labelled "View...". If the user clicks the View button, a dialog box titled "Runway Configuration Viewer" shall appear and shall display the posted version, including the current runway control information, of the last

installed runway configuration. Thus, the Runway Configuration Viewer dialog box will display the runway configuration that will be installed.

3.7.4.4 Runway Configuration Viewer Dialog Box

The Runway Configuration Viewer (or "viewer") dialog box should be similar to the one in Figure 3-6. The area on the left contains a list of active runways. Only active runways shall appear on RBDT's or in the Ribbon Display Alerts text product windows.

The Ribbon Configuration portion of the viewer is the large area in the middle of the dialog box. It shall contain a column for each RBDT associated with the airport. The identifier for the RBDT shall be descriptive alphanumeric text. The rows represent the RBDT lines containing wind information for the specified runway.

The area on the right of the viewer shall be labelled "Viewable Configurations" and shall list the possible runway configurations for the specified airport. This list provides the means by which the user can select a runway configuration for viewing. If the user clicks on a configuration, that configuration shall be loaded into the viewer. Once loaded into the viewer, the runway configuration is available for installation.

The viewer shall have a button labelled "Install". If the user clicks on the Install button and the SD does not control the configuration for that airport, a confirmation dialog box (Section 3.7.4.5) shall appear. If the user clicks on the Install button and the SD controls the configuration for that airport, Section 3.7.4.6 will apply.

3.7.4.5 Confirmation of Transfer of Configuration Control

The confirmation dialog box shall contain the text "This SD does not currently control the runway configuration for <airport location code>. Runway configuration is controlled by <controlling SD>. Do you still want to take control and install a runway configuration?" If "Yes" is chosen, runway configuration control shall be passed to the initiating SD and Section 3.7.4.6 will apply.

3.7.4.6 Configuration Installation

The selected configuration shall become the current configuration for the airport. The configuration data shall be conveyed to the PG for dissemination of the Runway Configuration product.

3.8 Product Status Buttons

3.8.1 Description

The Product Status Button section shall consist of two (2) rows of buttons. The top row of buttons shall be labelled (from left to right) "MB", "Precip", "Stm ExP", "Stm Mot", "Stm Cell", "Tornado", and "ATIS". The bottom row of buttons shall be labelled (from left to right) "GF", "ASR", "RD Alerts", "Term Text", "Term Wind", "Lightning", and "Rwy Config" (Figure 3-7). The relationship between the product status buttons and the display products is indicated by the paragraph numbers listed in Table 3-2.

DFW – Runway Configuration Viewer															

North_Flow Ribbon Display Configuration

Viewable Configurations

Active Runways	DFW East Tower					DFW Center Tower					DFW West Tower				
	SUP	LC1	LC2	GC1	GC2	SUP	LC1	LC2	GC1	GC2	SUP	LC1	LC2	GC1	GC2
31L	35CA	35CA	35CA	35CA	35CA	35CA	35CA	35CA	36LA	36LA	36LA	36LA	36LA	36LA	36LA
36L	35CD	35CD	35CD	35CD	35CD	35CD	35CD	35CD	36LD	36LD	36LD	36LD	36LD	36LD	36LD
36R	35LA	35LA	35LA	35LA	35LA	35LA	35LA	35LA	36RA	36RA	36RA	36RA	36RA	36RA	36RA
35L	35LD	35LD	35LD	35LD	35LD	35LD	35LD	35LD	36RD	36RD	36RD	36RD	36RD	36RD	36RD
35C	31RA	31RA	31RA	31RA	31RA	36LA	31RA	31RA	31LA	31LA	31LA	31LA	31LA	31LA	31LA
31R	31RD	31RD	31RD	31RD	31RD	36LD	31RD	31RD	31LD	31LD	31LD	31LD	31LD	31LD	31LD
35R	35RA	7	7	7	7	36RD	35RA	35RA	7	7	35CA	7	7	7	7
	35RD	8	8	8	8	31RA	35RD	35RD	8	8	35CD	8	8	8	8

◆ North_Flow
◇ South_Flow
◇ South_Flow_17L35R_Closed
◇ South_Flow_17C35C_Closed
◇ South_Flow_17L35R_Closed

[Install]   [Close]

Figure 3-6. Runway Configuration Viewer dialog box.

Figure 3-7. Product status buttons.

Product Status Button	Alert Product	Graphics Product	Text Product
MB		3.10.4	
Precip		3.10.2	
Stm ExP		3.10.3	
Stm Mot		3.10.3	
Stm Cell		3.11.3	3.11.3
Tornado	3.9.4	3.10.8	3.11.2
ATIS	3.9.2 3.9.3		
GF	3.9.5	3.10.5 3.10.6	
ASR	3.9.7	3.10.7	
RD Alerts		3.10.9	3.11.2
Term Text			3.11.5
Term Wind			3.11.4
Lightning	3.9.6		
Rwy Config			3.11.6

Table 3-2. Association Between the Product Status Buttons and the Display Products.

3.8.1.1 Button Color

The product status button color reflects the status of the associated products for the airport in the active graphics window. There are three possible status values for each product associated with an airport: Available, Unavailable, and Not Supported. Available denotes a product, associated with the airport in the active graphics window, whose data are available for display. Unavailable denotes a product, associated with the airport in the active graphics window, whose data are not available for display due to a temporary condition, such as a sensor failure. Not Supported is used to denote a product that is not supported by design and thus whose data are not available for display due to a permanent condition, such as absence of an algorithm to produce the required information. The Not Supported status pertains to TDWR and LLWAS Product Display Operational Modes.

When all products associated with the product status button are not supported, the button color will be gray, as described in Sections 4.1 and 5.1. If some, but not all, of the products associated with the product status button are not supported, products that are not supported will not affect the color of the product status button.

If any product represented by the product status button is unavailable for the airport in the active graphics window, the color of the button shall be red.

For Graphics products, if all of the associated supported products are available and all are turned on but none are filtered in the active graphics window, the button color shall be green. If all of the associated supported products are available and any are turned off in the active graphics window, the button color shall be white. If all of the associated supported products are available and any are being filtered (*e.g.,* by precipitation level) in the active graphics window, the button color shall be yellow.

For Text and Alert products, if the product is available and turned on for the airport in the active graphics window, the button color shall be green. If the product is available and turned off for the airport in the active graphics window, the button color shall be white. The colors of the product status button for those buttons which include at least one supported product are summarized in Table 3-3.

Product Display State	All Supported Products Available	At Least One Supported Product Unavailable
Turned Off	white	red
Turned On but Not Filtered	green	red
Turned On and Filtered	yellow	red

Table 3-3. Product status button colors.

3.8.2 User Interaction

Unless specified, clicking on the Product Status Buttons shall be considered an invalid selection. Clicking the right mouse button on any product status button that is not gray shall cause the display of a dialog box (Section 3.8.3).

3.8.3 Dialog Boxes Associated with Product Status Buttons

3.8.3.1 Description

The contents of the dialog box shall reflect the appropriate information for the product associated with the active graphics window. If a different graphics window is made active, the contents of the dialog box shall update automatically.

3.8.3.2 Status and State

Dialog boxes shall have one (1) status line for each product associated with the button. The text appearing on the status line shall be constructed from the product-specific status label as defined

in Table C-1, followed by a ":", followed by a modifier indicating product availability. For the single product case, the modifier will be either "Available" or "Unavailable"; while for the multiple product case, the modifier will be either "Available", "Unavailable", or "Not Supported", depending on the availability of the product. For example, "Status: Available" will appear in the Microburst dialog box when the microburst product is available and "100 nm: Not Supported" will appear in the text on the status line for the 100 nm Precipitation Product in the Precipitation Dialog Box for Product Display TDWR Operational Mode. A generic graphics product dialog box is shown in Figure 3-8.
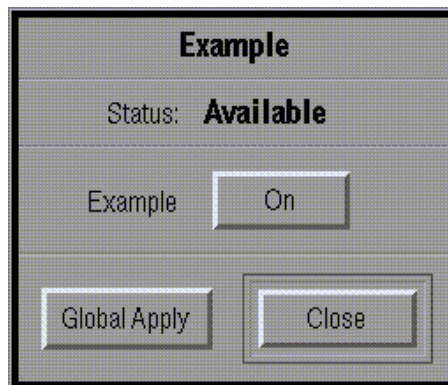
Figure 3-8. Generic dialog box for a graphics product.

Dialog boxes contain a state button when specified explicitly. The state button shall indicate the state of the product (on or off). By default, the text adjacent to the button shall be the same as the label on the product status button. The text on the button shall be either "On" or "Off", reflecting the current state of the product.

The product status and state information shall update as required to reflect the current product status and state.

3.8.3.3 Options

The dialog box may contain additional user options. These options are described throughout this Display Description under the subheading "Product Status Button."

3.8.3.4 Global Apply

Dialog boxes contain a Global Apply button when specified explicitly. The Global Apply button shall be labelled "Global Apply" (e.g., Figure 3-8). If the user clicks on the Global Apply button, all graphics windows shall be modified to conform to the option settings in the dialog box. For example, if the user wishes to turn the StmExp products off in all graphics windows, the user would first select the on/off button to turn the products off in the active graphics window and then select Global Apply to turn the products off in all graphics windows.

3.9 Alert Products

There shall be an Alert Products Section in the upper right corner of the protected area of the screen. The format of the Alert Products Section for one (1) airport is shown in Figure 3-9, for two (2) airports in Figure 3-10, and for three (3) airports in Figure 3-11.

Figure 3-9. Format of Alert Products Section for one (1) airport.

Figure 3-10. Format of Alert Products Section for two (2) airports.

Figure 3-11. Format of Alert Products Section for three (3) airports.

The order of the elements in the Alert Products Section shall be (from left to right) airport indicator/product display operational mode button (Section 3.9.8), product display automatic mode transition indicator (Section 3.9.9), TDWR status (Section 3.9.10), Wind Shear: Timers: Microburst Alert ATIS (Section 3.9.2), Wind Shear: Timers: Wind Shear Alert ATIS (Section 3.9.3), Tornado: Alert (Section 3.9.4), Airport Lightning Warning (Section 3.9.6), Wind Shear: Timers: Gust Front Impact (Section 3.9.5), and ASR-9 Anomalous Propagation (AP): AP Alert (Section 3.9.7).

The SD shall have the capability to display alerts for each airport associated with the SD. The order of the airports shall be field-settable adaptation data set at the SD. For the one-airport (Figure 3-9), two-airport (Figure 3-10), and three-airport (Figure 3-11) cases, the Alert Products Section shall extend from the top of the display to the bottom of the Product Status Buttons. The

vertical extent of the Alert Products Section shall be divided equally to accommodate the number of airports. The maximum number of airports visible simultaneously in the Alert Products Section shall be configurable to three (3) or more via field-settable adaptation data set at the SD. When the number of airports visible simultaneously in the Alert Products Section is fewer than the number of airports associated with the SD, the Alerts Products Section shall be scrollable.

In some cases the alert text for the single-airport case will differ from that for the multi-airport case. In each of the following subsections labelled "Description", the text in quotes describes the text for the single-airport case; the text in square brackets ([ ]) describes the text for the multi-airport case.

3.9.1 Unavailable Alert Products

If an Alert product is unavailable, the associated Alert box or button shall revert to its unalerted condition.

3.9.2 Wind Shear: Timers: Microburst Alert ATIS

3.9.2.1 Description

The SD shall display the Wind Shear: Timers: Microburst Alert ATIS product for each airport associated with the SD. The product shall be displayed with a button for each airport in the Alert Products Section of the display. When the PG indicates that the Wind Shear: Timers: Microburst Alert ATIS timer is off, the button shall be colored Background Gray with the letters "MBA" [MBA] in black in the center. When the PG indicates that the Wind Shear: Timers: Microburst Alert ATIS timer is active the button shall be colored Microburst Red with the letters "MBA" [MBA] in black in the center of the button. When the PG indicates that the Wind Shear: Timers: Microburst Alert ATIS timer is counting down, the button shall be colored Microburst Red and the letters "MBA XX" [MBA XX] shall appear in black inside the button, where XX are data supplied by the algorithm. Table 3-4 provides these parameters in tabular format.

Timer Condition	Button Color	Text	Text Color
Off	Background Gray	MBA [MBA]	black
Active	Microburst Red	MBA [MBA]	black
Timer	Microburst Red	MBA XX [MBA XX]	black

Table 3-4. Wind Shear: Timers: Microburst Alert ATIS Product Parameters.

3.9.2.2 User Interaction

Pilots may report microbursts for which the ITWS does not issue an alert. In the case of pilot reports (PIREPs) of microburst the controllers are required to put a microburst message on the ATIS. The Wind Shear: Timers: Microburst Alert ATIS product supports this requirement by

allowing the user to initiate the timer. This process is referred to as "submitting a PIREP to the SD." Users also have the ability to "withdraw" the PIREP.

Some SDs shall be configured, via field-settable adaptation data set at the MDT, to support PIREPs. If the SD is not so configured and the user attempts to enter a PIREP the SD shall display a message in the System Status/Info text box. The text of the message shall be "This SD is not configured to support PIREP functionality."

If an SD is configured to support PIREPs, Sections 3.9.2.2.1 and 3.9.2.2.2 will apply.

3.9.2.2.1 Submit a Microburst Pilot Report

If the user clicks on the Wind Shear: Timers: Microburst Alert ATIS product button, the SD shall display a confirmation dialog box. If the user selects "Yes", the SD shall make available to the PG all data necessary to generate the Wind Shear: Timers: Microburst Alert ATIS product.

3.9.2.2.2 Withdraw a Microburst Pilot Report

If the user clicks the right mouse button in the Wind Shear: Timers: Microburst Alert ATIS product button, a confirmation dialog box shall appear. If the user selects "Yes", the SD shall make available to the PG all data necessary to generate the Wind Shear: Timers: Microburst Alert ATIS product.

PIREPS may only be withdrawn on the SD from which they are submitted. If the PG returns an error message to the SD that attempted to withdraw the PIREP, that SD shall display the error message in the System Status/Info text window.

3.9.2.2.3 Product Status Button

If the user clicks the right mouse button on the ATIS product status button, the SD shall display a dialog box titled "ATIS". The ATIS dialog box shall contain one (1) status line for each ATIS product. The status lines shall be labelled "Microburst Alert" and "Wind Shear Alert".

3.9.3 Wind Shear: Timers: Wind Shear Alert ATIS

3.9.3.1 Description

The SD shall display the Wind Shear: Timers: Wind Shear Alert ATIS product for each airport associated with the SD. The product shall be displayed with a button for each airport in the Alert Products Section of the display. When the PG indicates that the Wind Shear: Timers: Wind Shear Alert ATIS timer is off, the button shall be colored Background Gray with the letters "WSA" [WSA] in black in the center. When the PG indicates that the Wind Shear: Timers: Wind Shear Alert ATIS timer is active the button shall be colored white with the letters "WSA" [WSA] in Microburst Red in the center of the button. When the PG indicates that the Wind Shear: Timers: Wind Shear Alert ATIS timer is counting down, the button shall be colored white and the letters "WSA XX" [WSA XX] shall appear in Microburst Red inside the button, where XX are data supplied by the algorithm. Table 3-5 provides these parameters in tabular format.

Timer Condition	Button Color	Text	Text Color
Off	Background Gray	WSA [WSA]	black
Active	white	WSA [WSA]	Microburst Red
Timer	white	WSA XX [WSA XX]	Microburst Red

Table 3-5. Wind Shear: Timers: Wind Shear Alert ATIS Product Parameters.

3.9.3.2 User Interaction

Pilots may report wind shear for which the ITWS does not issue an alert. In the case of pilot reports of wind shear the controllers are required to put a wind shear message on the ATIS. The ATIS Timer supports this requirement by allowing the user to initiate the timer. This process is referred to as "submitting a PIREP to the SD." Users also have the ability to "withdraw" the PIREP.

Some SDs will be configured to support PIREPs as in Section 3.9.2.2.

If an SD is configured to support PIREPs, Sections 3.9.3.2.1 and 3.9.3.2.2 will apply.

3.9.3.2.1 Submit a Wind Shear Pilot Report

If the user clicks on the Wind Shear: Timers: Wind Shear Alert ATIS product button, the SD shall display a confirmation dialog box. If the user selects "Yes", the SD shall [shall removed] make available to the PG all data necessary to generate the Wind Shear: Timers: Wind Shear Alert ATIS product.

3.9.3.2.2 Withdraw a Wind Shear Pilot Report

If the user clicks the right mouse button in the Wind Shear: Timers: Wind Shear Alert ATIS product button, a confirmation dialog box shall appear. If the user selects "Yes", the SD shall make available to the PG all data necessary to generate the Wind Shear: Timers: Microburst Alert ATIS product.

PIREPS may only be withdrawn on the SD from which they are submitted. If the PG returns an error message to the SD that attempted to withdraw the PIREP, that SD shall display the error message in the System Status/Info text window.

3.9.3.2.3 Product Status Button

The operation of the product status button is as described in Section 3.9.2.2.3.

3.9.4 Tornado: Alert

3.9.4.1 Description

The SD shall display the Tornado: Alert product for all ITWS airports associated with a SD. The product shall be displayed with a box for each airport in the Alert Products Section of the SD. When the product shows that there is no tornado within the XX distance from the airport (where XX is data supplied by the algorithm), the box shall be colored Background Gray with the letters "Tornado XX nm" [TOR XXnm] in black in the center of the box. When the product is unavailable, the XX distance is unknown. In that case, the box shall be colored Background Gray with the letters "Tornado" [TOR] in black in the center of the box. When the product shows that there is at least one (1) tornado within the XX distance, the box shall be colored black with the letters "Tornado XX nm" [TOR XXnm] colored white in the center of the box. Table 3-6 provides these parameters in tabular format.

Condition	Box Color	Text	Text Color
Product unavailable	Background Gray	Tornado [TOR]	black
No tornado within XX nm	Background Gray	Tornado XX nm [TOR XXnm]	black
Tornado within XX nm	black	Tornado XX nm [TOR XXnm]	white

Table 3-6. Tornado: Alert Product Parameters.

3.9.4.2 User Interaction

If the user clicks any mouse button on the alert box, it shall be considered an invalid selection.

3.9.4.2.1 Product Status Button

The operation of the product status button is as described in Section 3.10.8.2.1.

3.9.5 Wind Shear: Timers: Gust Front Impact

3.9.5.1 Description

The SD shall display the Wind Shear: Timers: Gust Front Impact product for each airport associated with the SD. The product shall be displayed with a box for each airport in the Alert Products Section of the SD. When the product indicates that there is no gust front within YY minutes (where YY is data supplied by the algorithm) of the airport, the box shall be colored Background Gray with the letters "Gust Front YY min" [GF YYmin] in black in the center of the box. When the product is unavailable, the YY distance is unknown. In that case, the box shall be colored Background Gray with the letters "Gust Front" [GF] in black in the center of the box. When the product indicates that a gust front is within YY minutes of the airport, the box shall be colored Gust Front Purple with the text "Gust Front XX min" [GF XXmin] (where XX is data supplied by the algorithm to indicate the expected time of arrival of the gust front at the airport)

colored white in the center of the box. When the product indicates that a gust front is impacting the airport, the box shall be colored Gust Front Purple with the words "Gust Front" [GF] colored white in the center of the box. Table 3-7 provides these parameters in tabular format.

Condition	Box Color	Text	Text Color
Product unavailable	Background Gray	Gust Front [GF]	black
No gust front within YY minutes	Background Gray	Gust Front YY min [GF YYmin]	black
Gust front within YY minutes	Gust Front Purple	Gust Front XX min [GF XXmin]	white
Gust front impacting airport	Gust Front Purple	Gust Front [GF]	white

Table 3-7. Wind Shear: Timers: Gust Front Impact Product Parameters.

3.9.5.2 User Interaction

If the user clicks any mouse button on the alert box, it shall be considered an invalid selection.

3.9.5.2.1 Product Status Button

The operation of the product status button is as described in Section 3.10.5.3.1.

3.9.6 Airport Lightning Warning

3.9.6.1 Description

The SD shall display the Airport Lightning Warning product for all ITWS airports associated with the SD. The product shall be displayed with a box for each airport in the Alert Products Section of the display. When the product indicates that there is no lightning within the XX distance (where XX is data supplied by the algorithm) of the airport, the box shall be colored Background Gray with the letters "Lightning XX nm" [LGT XXnm] in black in the center of the box. When the product is unavailable, the XX distance is unknown. In that case, the box shall be colored Background Gray with the letters "Lightning" [LGT] in black in the center of the box. When the product shows that there is lightning within the XX distance, the box shall be colored Lightning Yellow with the letters "Lightning XX nm" [LGT XXnm] colored black in the center of the box. Table 3-8 provides these parameters in tabular format.

3.9.6.2 User Interaction

If the user clicks any mouse button on the alert box, it shall be considered an invalid selection.

3.9.6.2.1 Product Status Button

If the user clicks the right mouse button on the Lightning product status button, the SD shall display a dialog box titled "Lightning".

Condition	Box Color	Text	Text Color
Product unavailable	Background Gray	Lightning [LGT]	black
No lightning within XX distance	Background Gray	Lightning XX nm [LGT XXnm]	black
Lightning within XX distance	Lightning Yellow	Lightning XX nm [LGT XXnm]	black

Table 3-8. Airport Lightning Warning Impact Product Parameters.

3.9.7 ASR-9 Anomalous Propagation (AP): AP Alert

3.9.7.1 Description

The SD shall display the ASR-9 Anomalous Propagation (AP): AP Alert product for all ITWS airports associated with the SD. The product shall be displayed with a box for each airport in the Alert Products Section of the display. When the product indicates that no operationally significant AP exists, the box shall be colored Background Gray with the letters "AP" [AP] in black in the center of the box. When the product indicates that operationally significant AP exists, the box shall be colored black with the letters "AP" [AP] colored white in the center of the box. Table 3-9 provides these parameters in tabular format.

Condition	Box Color	Text	Text Color
Product unavailable	Background Gray	AP [AP]	black
No operationally significant AP	Background Gray	AP [AP]	black
Operationally significant AP	black	AP [AP]	white

Table 3-9. ASR-9 Anomalous Propagation (AP): AP Alert Product Parameters.

3.9.7.2 User Interaction

If the user clicks any mouse button on the alert box, it shall be considered an invalid selection.

3.9.7.2.1 Product Status Button

The operation of the product status button is as described in Section 3.10.7.2.1.

3.9.7.3 Adaptation Data

The areal extent of AP that defines operationally significant AP shall be field-settable adaptation data set at the MDT.

3.9.8 Airport Location and Product Display Operational Mode Selection

3.9.8.1 Description

The capability to switch the Product Display Operational Mode of the SD shall exist. The Product Display Operational modes to which the SD is allowed to switch shall be site-adaptation data.

There shall be a Mode button at the left of each row that contains the airport location code and the Product Display Operational mode in black text. For the one-airport case, the text shall appear as shown in Figure 3-9. For more than one airport, the text shall appear as shown in Figures 3-10 and 3-11.

The background color of the Mode button shall be red if there are any unavailable products associated with the airport in the selected product display operational mode. The background color of the Mode button shall be Background Gray if there are no unavailable products.

3.9.8.2 User Interaction

If the user clicks the left or right mouse button on the Mode button, the SD shall display a Mode dialog box (Figure 3-12). The mode dialog box shall contain three (3) buttons labelled "ITWS", "TDWR", and "LLWAS". The dialog box shall indicate the currently selected mode. If a Product Display Operational mode is unavailable, it shall be unselectable and shall be indicated as such. The Mode dialog box shall also contain an Automatic Mode Transition button.
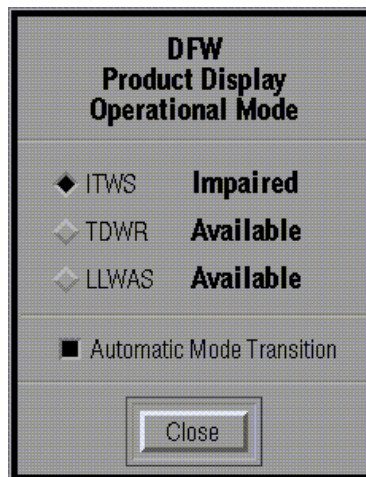
Figure 3-12. Product Display Operational Mode dialog box.

3.9.8.2.1 Product Display ITWS Operational Mode

If the user selects the ITWS button, the SD shall switch to Product Display ITWS Operational mode.

3.9.8.2.2 Product Display TDWR Operational Mode

If the user selects the TDWR button, the SD shall switch to Product Display TDWR Operational mode.

3.9.8.2.3 Product Display LLWAS Operational Mode

If the user selects the LLWAS button, the SD shall switch to Product Display LLWAS Operational mode.

3.9.8.2.4 Product Display Mode Transition Mode

[shall removed][shall removed][shall removed]

The user shall be able to activate and deactivate automatic product display mode transitions by selecting the Automatic Mode Transition button. If the user selects a product display operational mode, automatic product display mode transition shall be deactivated. The Automatic Mode Transition button shall indicate whether or not automatic transition is activated.

3.9.9 Automatic Mode Transition Indicator

3.9.9.1 Description

There shall be an Automatic Mode Transition Indicator to the right of the Mode button. If automatic product display mode transition is activated, the indicator shall be Background Gray with black text. The text shall be "AUTO" [A]. If automatic product display mode transition is deactivated, the indicator shall have a white background with "MANUAL" [M] in black text.

3.9.10 TDWR Status

3.9.10.1 Description

There shall be a TDWR status area to the right of the Automatic Mode Transition indicator that contains the text "TDWR" as in Figures 3-9, 3-10, and 3-11.

If an SD is configured to operate in TDWR Product Display TDWR Operational Mode and operational TDWR products are available via the backup link, the background color of the TDWR status area shall be green. Otherwise, the background color of the TDWR status area shall be red.

3.10 Graphics Products

For this document the term "storm" is defined as a contiguous area of precipitation that is above a certain level. (The level is specified in the algorithm.) The term "cell" is defined as a local maxima of precipitation that is at or above the storm threshold. A storm will often include several cells.

Unless otherwise specified, the information in Sections 3.1 through 3.4 applies to the display of graphics products.

3.10.1 Unavailable Graphics Products

If a Graphics product becomes unavailable, it shall be removed from the associated graphics window until it becomes available.

3.10.2 Precipitation

The ITWS Precipitation products are named for their maximum range extent (*e.g.,* 5 nm, TRACON, 100 nm, and 200 nm). The sources of these products are shown in Table 3-10.

Product Name	Product Data Sources
5 nm	TDWR surface scan
TRACON	Mosaic of ASR-9 Radars
100 nm	NEXRAD 1km Composite
200 nm	NEXRAD 4km Composite

Table 3-10. Precipitation Product Names and Corresponding Data Sources.

There are a number of display range options (Section 3.4.3.6) that affect the way the data are displayed in the graphics windows. For example, if the user chooses the 30 nm display range, the TRACON product will be displayed in the active graphics window. The distance from the center of the window to the nearest window edge will represent 30 nm. The display range options and their corresponding precipitation products shall be as specified in Table 3-11. These display range options shall be the means by which a user may change a precipitation product in a graphics window. In addition, the display range options that apply to the TRACON product allow the users to change the display range to a fixed range with a mouse click, rather than requiring the user to pan and/or zoom to the desired range.

Display Range Option	Displayed Precipitation Product
5 nm	5 nm product
10 nm	TRACON product
15 nm	TRACON product
30 nm	TRACON product
50 nm	TRACON product
TRACON	TRACON product
100 nm	100 nm product
200 nm	200 nm product

Table 3-11. Display Range Options and Corresponding Precipitation Products.

3.10.2.1 Description

Precipitation shall be displayed in the NWS six (6) level color scale. The relevant regions of the graphics window background shall be colored No Data Gray when

- there is no precipitation product available for display at the selected range or

- the precipitation product is available for display at the selected range and the region is not covered by that precipitation product or

- the precipitation product is available for display at the selected range and the region is covered by that precipitation product but not by any radar(s) used for that precipitation product.

Regions that do have radar coverage but contain reflectivities less than NWS level one (1) or invalid data shall be identified by the Background Gray. Regions in the TDWR-based precipitation products that are attenuated shall be identified by TDWR Attenuation Gray. Attenuated regions in the TDWR-based precipitation products shall be displayed

- in Attenuation Gray if at least one (1) of the levels one (1) through six (6) is displayed and

- in Background Gray otherwise.

3.10.2.1.1 Primary and Fallback Data Sources

The primary and fallback sources of the precipitation data will depend on the currently selected range of the graphics window as in Table 3-12.

Currently Selected Range	Primary Source	Fall back Source
5nm	TDWR surface scan	ASR-9
10nm	ASR-9	TDWR
15nm	ASR-9	TDWR
30nm	ASR-9	TDWR
50nm	ASR-9	TDWR
TRACON	ASR-9	TDWR
100 nm	NEXRAD 1km composite	none
200 nm	NEXRAD 4km composite	none

Table 3-12. Sources of Precipitation Data for Graphics Windows.

3.10.2.2 Default

Each graphics window shall display a Precipitation product by default. Precipitation levels one (1) through six (6) shall be displayed by default in all graphics windows.

3.10.2.3 User Interaction

The user may filter the precipitation levels that are displayed in each window using the product status button.

3.10.2.3.1 Product Status Button

If the user clicks the right mouse button on the Precip product status button the SD shall open a dialog box titled "Precipitation". The Precipitation dialog box shall contain a status line for each Precipitation product. The dialog box shall contain five (5) buttons labelled "1-6", "3-6", "4-6", "5-6", and "None". The dialog box shall indicate the currently selected option in the active graphics window. If the user clicks any option, the SD shall display in the active graphics window

- the associated precipitation levels in the appropriate NWS six level colors and

- the remaining precipitation levels in Background Gray.

The Precipitation dialog box shall contain a global apply button which operates as described in Section 3.8.3.4.

If the user clicks on the Precip product status button, the SD shall toggle the precipitation product between None and 1-6 in the active graphics window.

3.10.3 Storm Motion and Extrapolated Position

In each graphics window the SD shall allow the display of the Storm Motion and Extrapolated Position product that is computed based on precipitation product that is displayed in that window. Thus, there is a different Storm Motion and Extrapolated Position product for each precipitation product. Hereafter, the term "product" when used in conjunction with Storm Motion and Extrapolated Position product means the Storm Motion and Extrapolated Position product based upon the underlying precipitation product.

There are two components to the display of the Storm Motion and Extrapolated Position product: storm extrapolated position lines and storm motion arrows and numbers. The extrapolated position lines will hereafter be referred to as SEPs. The storm motion arrows and numbers will hereafter be referred to as SMs. SEPs are associated with storms; SMs are associated with storm cells within a storm. These display concepts are treated separately in the following sections.

3.10.3.1 Description

3.10.3.1.1 Storm Motion

The Storm Motion indicator shall be a black arrow and a black number associated with each storm cell. The base of each arrow shall be placed at the location designated by the algorithm. The corresponding number shall be placed near the base of the arrow. The arrow shall not obscure the number. The arrow shall point in the direction of motion as computed by the algorithm.

3.10.3.1.2 Extrapolated Positions

The leading edge of the storm shall be indicated with a solid cyan line. The extrapolated positions of the leading edge (*e.g.,* 10 and 20 minutes) shall be indicated with dashed cyan lines.

Figure 3-13 shows a typical representation of the SEPs and SMs.
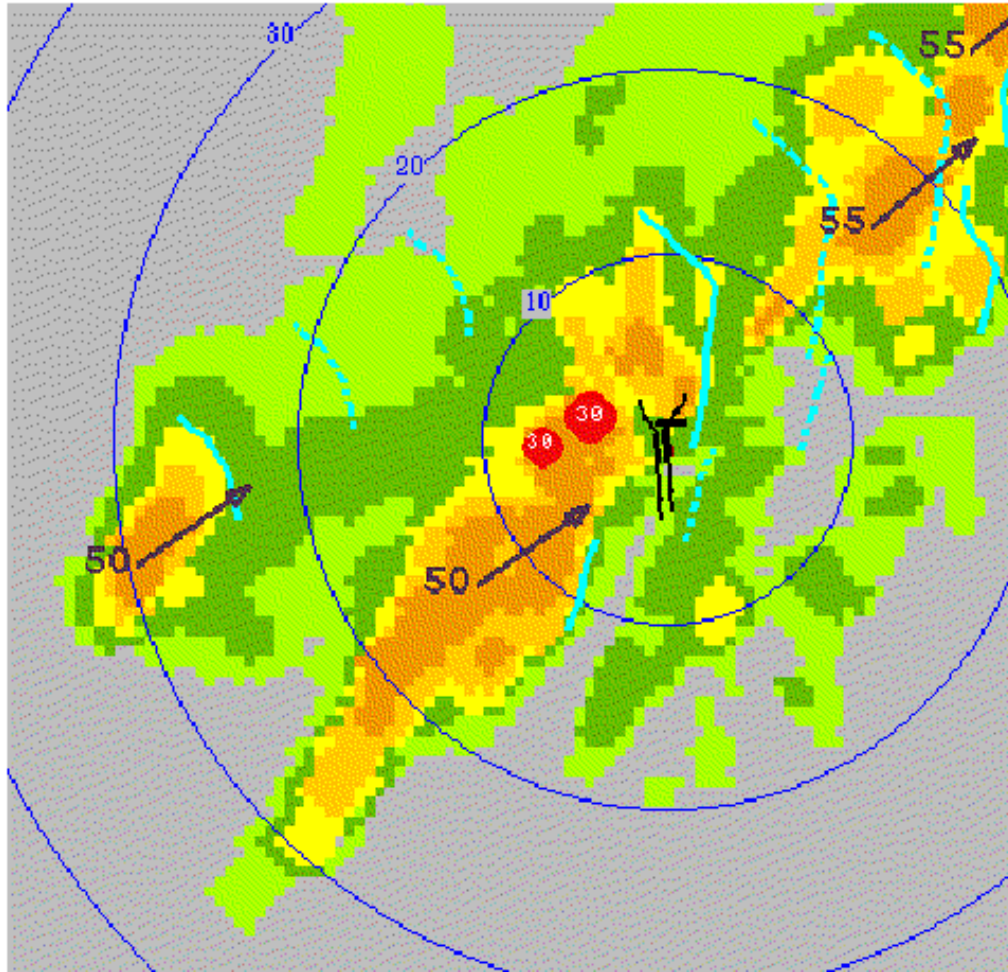
Figure 3-13. Storm Motion and Extrapolated Position product.

3.10.3.2 Defaults

3.10.3.2.1 Automatic Selection

When a graphics window is created, the SD shall display the Storm Motion and Extrapolated Position product for storms according to adaptable rules (Section 3.10.3.4). The default rules shall be as provided in Table 3-13. Within each range category, the storms that are closest to the ARP shall be selected for automatic display.

3.10.3.3 User Interaction

The user shall be able to select and de-select storms for which the associated Storm Motion and Extrapolated Position product will be displayed.

Currently Selected Range	Auto-selections
5 nm	No auto-selections. Display SEP and SM for all storms.
10 nm - TRACON	1 storm within 10 nm of the ARP
	2 between 10 and 30 nm
	2 from 30 nm to TRACON
100 nm	1 within 50 nm
	2 between 50 and 100 nm
200 nm	1 storm within 50 nm
	2 between 50 and 100 nm
	2 between 100 and 200 nm

Table 3-13. Automatic Selection of SEPs/SMs.

3.10.3.3.1 User Selection

Using the middle mouse button, the user shall be able to enter the locations of storms whose SEPs and SMs will be displayed.

When the user clicks the middle mouse button in the active graphics window (while the window is in Product Interaction GWI Mode as described in Section 3.4.1.3), the cursor location at the time of the click becomes a "location of interest" for the associated Storm Motion and Extrapolated Position product. The SD shall retain up to 100 locations of interest per Storm Motion and Extrapolated Position product, regardless of the number of available storms. These locations of interest shall be retained if the Storm Motion and Extrapolated Position products are turned off. The locations of interest shall be cleared if the SD is restarted.

If the user's selection does not exceed the number of available storms, the SD shall display the SEPs and SMs for the closest storm. The closest storm is the storm whose centroid is closest to the location of interest and whose SEPs and SMs are not yet displayed in the active graphics window. Every time the Storm Motion and Extrapolated Position product is updated, the SD shall recompute the storms closest to the locations of interest.

If the user's selection exceeds the number of available storms, the SD shall display a message in the System Status/Info text window. The text of the message shall be "No StmExP/StmMot to select."

3.10.3.3.2 User De-selection

The user shall be able to de-select user-selected SEPs and SMs using the right mouse button.

If the user clicks the right mouse button in the active graphics window to de-select a location of interest (while the window is in Product Interaction GWI Mode as described in Section 3.4.1.3) and the nearest storm is one for which the SEP and/or SMs are being displayed automatically, the

SD shall display a message in the System Status/Info text window. The text of the message shall be "Automatically selected StmExP/StmMot - Unable to de-select."

If the user clicks the right mouse button in the active graphics window and the nearest storm is one for which the SEP and/or SMs are being displayed via user-selection, the SD shall remove the location of interest associated with the storm closest to the cursor from the list of locations of interest for the Storm Motion and Extrapolated Position product and the active graphics window shall be updated. If the user attempts to de-select more locations of interest than have been selected, the SD shall display a message in the System Status/Info text window. The text of the message shall be "No more StmExP/StmMot to de-select."

3.10.3.3.3 Product Status Button

If any one of the Storm Motion and Extrapolated Position products is unavailable, the Stm Mot and Stm ExP product status buttons shall both be red.

If the user clicks on the Stm ExP product status button the SD shall toggle the SEPs between on and off in the active graphics window.

If the user clicks on the Stm Mot product status button the SD shall toggle the SMs between on and off in the active graphics window.

If the user clicks the right mouse button on the Stm ExP product status button, the SD shall open a dialog box titled "Stm ExP" and a dialog box titled "StmExP/StmMot". If the user clicks the right mouse button in the Stm Mot product status button the SD shall open a Stm Mot dialog box and a StmExP/StmMot dialog box. The dialog boxes should be similar to Figure 3-14. The StmExP/StmMot dialog box is common to both product status buttons and user input in this dialog box shall apply to both SEPs and SMs. If either or both are selected by the user via their product status buttons, only one (1) StmExP/StmMot dialog box shall be displayed. If and only if either the Stm ExP and/or Stm Mot dialog boxes are displayed, the StmExP/StmMot dialog box shall be displayed.

3.10.3.3.3.1 Stm Mot Dialog Box

The Stm Mot dialog box shall contain a state button (Section 3.8.3.2). The state button on the Stm Mot dialog box allows the user to turn on or off the display of all SMs (automatically selected and user-selected) in the active graphics window. The text on the state button indicates the state of the SMs in the active graphics window. If the user clicks on the state button, the SD shall toggle the display of the SMs for all Storm Motion and Extrapolated Position products in the active graphics window between on and off and shall toggle the button label to reflect the state of the Storm Motion and Extrapolated Position products. The dialog box shall contain a global apply button (Section 3.8.3.4).

3.10.3.3.3.2 Stm ExP Dialog Box

The Stm ExP dialog box shall contain a state button (Section 3.8.3.2). The state button on the Stm ExP dialog box allows the user to turn on or off the display of all SEPs (automatically selected and user-selected) in the active graphics window. The text on the state button indicates the state of the SEPs in the active graphics window. If the user clicks on the state button, the SD shall toggle the SEPs for all Storm Motion and Extrapolated Position products in the active graphics window

Figure 3-14. Examples of Stm ExP, Stm Mot, and StmExP/StmMot dialog boxes.

between on and off and shall toggle the button label to reflect the state of the Storm Motion and Extrapolated Position products. The dialog box shall contain a global apply button (Section 3.8.3.4).

3.10.3.3.3 StmExP/StmMot Dialog Box

The StmExP/StmMot dialog box shall contain two (2) sections titled "Automatic Selections" and "User Selections". The Automatic Selections section controls the display of automatically selected SEPs and SMs. The User Selections section provides the capability to delete all user-selected SEPs and SMs with a single button click. There shall be no Close button on the StmExP/StmMot dialog box.

The Automatic Selections section shall contain five (5) buttons labelled "On" or "Off" to reflect the current state of the automatically selected SEPs and SMs. The text adjacent to the button shall be "All Ranges", "5 nm", "TRACON", "100 nm", and "200 nm". If the user clicks on an on/off button, the SD shall toggle the automatically selected SEPs and SMs for the associated Storm

Motion and Extrapolated Position product between on and off and shall toggle the button label to reflect the state of the automatically selected SEPs and SMs. The SD shall update the active graphics window. The Automatic Selections section shall contain a Global Apply button.

If Automatic Selections are off, all automatically selected SEPs and SMs shall be available to be displayed as User Selections.

The User Selections section shall contain five (5) buttons labelled "Delete". The text adjacent to the buttons shall be "All Ranges", "5 nm", "TRACON", "100 nm", and "200 nm". If the user clicks on a Delete button, the SD shall remove all locations of interest for the associated Storm Motion and Extrapolated Position product and shall update the display. If the user selects the All Ranges button, the SD shall remove all locations of interest for all Storm Motion and Extrapolated Position products and shall update the active graphics window.

3.10.3.4 Adaptation Data

The rules for automatic selection of SEPs and SMs shall be field-settable at the MDT.

3.10.4 Wind Shear: Microburst Detection/Prediction

3.10.4.1 Description

Wind shears with loss values equal to or greater than 30 knots, or microbursts, shall be displayed as solid Microburst Red shapes with white text in the center of the shape indicating the loss value in knots (Figure 3-15). Wind shears with loss values less than 30 knots shall be displayed as unfilled Microburst Red shapes with Microburst Red text in the center of the shape indicating the loss value (Figure 3-16).
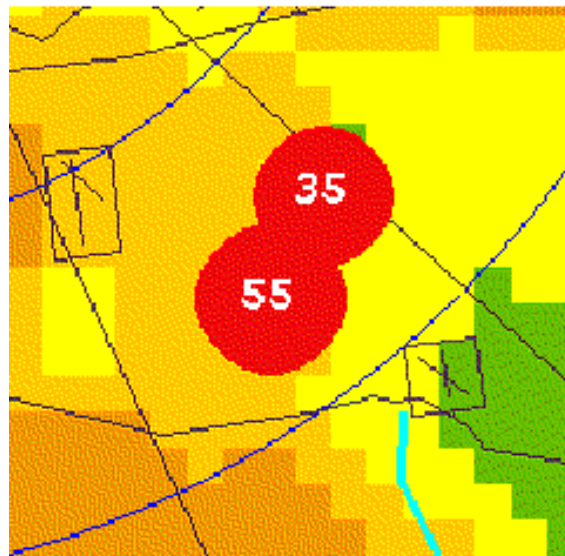
Figure 3-15. Example of microburst shapes.

The Microburst Detection/Prediction product shall not be displayed on the 100 nm and 200 nm precipitation products.
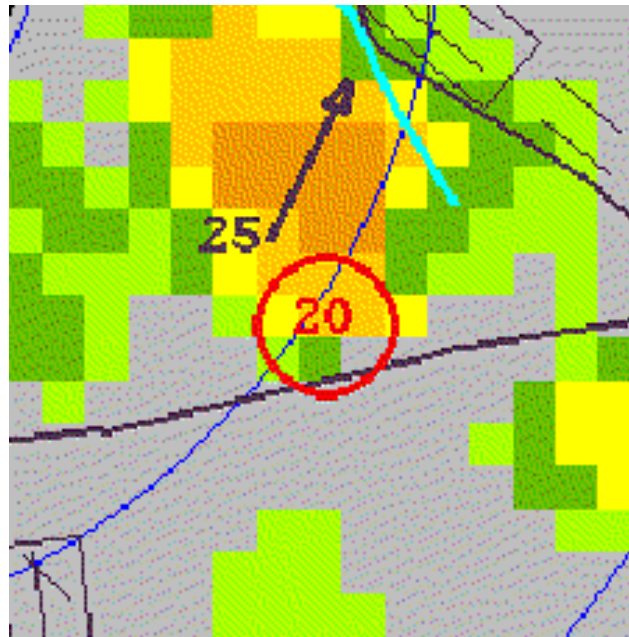
Figure 3-16. Example of wind shear shapes.

3.10.4.2 User Interaction

3.10.4.2.1 Product Status Button

If the user clicks on the MB product status button, the SD shall remove the microburst and wind shear shapes from the active graphics window for five (5) seconds. The product status button shall indicate that the product is off during that time. While the product is off, input using the left mouse button shall be disabled. The user must not be able to turn the Microburst Detection/Prediction product off for more than five (5) seconds.

If the user clicks the right mouse button on the MB product status button, the SD shall display a dialog box titled "Microburst". The dialog box shall contain a state button (Section 3.8.3.2). If the user clicks the state button, the SD shall remove the red shapes from the active graphics window for five (5) seconds. The text associated with the state button shall indicate that the product is off and the state button shall be unselectable during that time.

3.10.5 Wind Shear: Gust Front Detection and Forecast

3.10.5.1 Description

Gust front detections shall be displayed with a solid Gust Front Purple line; 10 and 20 minute gust front forecasts shall be displayed with dashed Gust Front Purple lines (Figure 3-17).

The Gust Front Detection and Forecast product shall not be displayed on the 100 nm and 200 nm precipitation products.

3.10.5.2 Default

Gust front forecasts shall be displayed by default.
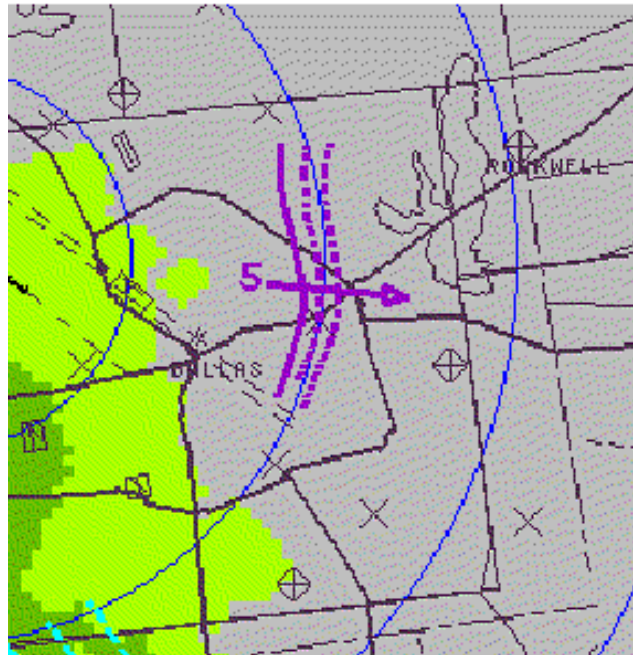
Figure 3-17. Example of Gust Front Detection and Forecast, and Gust Front Wind Shift Estimate products.

3.10.5.3 User Interaction

The user shall not be able to turn off gust front detections. The user shall be able to filter Gust Front forecasts.

3.10.5.3.1 Product Status Button

If the user clicks on the GF product status button, the SD shall toggle the display of the gust front forecasts in the active graphics window. If forecasts are not displayed, the color of the product status button will be yellow in accordance with Section 3.8.1.1.

If the user clicks the right mouse button on the GF product status button, the SD shall display a dialog box titled "Gust Front". The status lines shall be labelled: "Detection and Forecast", "Wind Shift Estimate", and "Impact". The Gust Front dialog box shall contain a button labelled "On" (or "Off"). The text adjacent to the button shall be "Forecasts:". If the user selects the Forecasts button, the SD shall toggle the display of the gust front forecasts in the active graphics window and shall toggle the button label. The dialog box shall contain a global apply button (Section 3.8.3.4).

3.10.6 Gust Front Wind Shift Estimate

3.10.6.1 Description

The Gust Front Wind Shift Estimate indicator shall be a Gust Front Purple arrow and a Gust Front Purple number. The wind shift estimate arrow shall point in the direction the wind is going. The

number representing the wind speed shall be placed near the base of the arrow. The arrow shall not obscure the number (Figure 3-17).

The Gust Front Wind Shift Estimate product shall not be displayed on the 100 nm and 200 nm precipitation products.

3.10.6.2 User Interaction

3.10.6.2.1 Product Status Button

The product status shall be shown using the GF product status button, the operation of which is described in Section 3.10.5.3.1.

The user shall not be able to turn off the display of the Gust Front Wind Shift Estimate product.

3.10.7 ASR-9 Anomalous Propagation (AP): Precipitation with AP Flagged

3.10.7.1 Description

The Precipitation with AP Flagged product shows the regions in which ASR-9 precipitation data are being edited because of suspected AP ground clutter. Precipitation with AP Flagged shall be displayed using the NWS six (6)-level color scale. AP shall be indicated in black. The SD shall re-center the active graphics window on the selected ASR-9. The range of the active graphics window shall be set to 50 nm. The window shall display the Precipitation with AP Flagged product from the selected ASR-9 for ten (10) seconds after which the active graphics window shall revert to its previous state. Only overlays, runways, and colorbars shall be displayable with the Precipitation with AP Flagged product.

3.10.7.2 User Interaction

3.10.7.2.1 Product Status Button

If the user clicks on the ASR product status button, the SD shall display the Precipitation with AP Flagged product for an ASR-9 radar. It is not possible to turn off the Precipitation with AP Flagged product. The ASR-9 radar shall be chosen automatically from a prioritized list (adaptation data; Section 3.10.7.3) of all ASR-9 radars associated with the airport in the active graphics window. The SD shall display the Precipitation with AP Flagged product for the highest priority ASR-9 radar containing operationally significant AP. If none of the Precipitation with AP Flagged products for the ASR-9 radars in the list contain operationally significant AP, the SD shall display the Precipitation with AP Flagged product for the highest priority ASR-9 radar for which the product is available. While the product is displayed, input using the left mouse button shall be disabled.

If the user clicks the right mouse button on the ASR product status button, the SD shall display a multiple-selection dialog box titled "ASR". The dialog box should be similar to Figure 3-18. The dialog box shall contain one (1) status line for each of the ASR-9 radars associated with the airport. Each status line associated with ASR-9 radar shall contain the name of the ASR-9 radar (adaptation data; Section 3.10.7.3). The order of the status lines for the ASR-9 radars shall be given by the prioritized list.
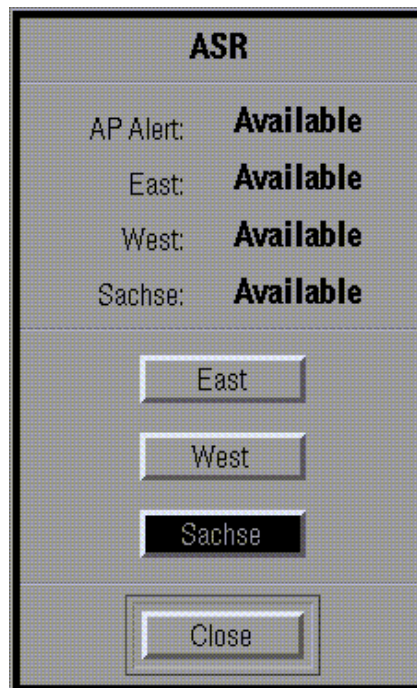
Figure 3-18. Example of an ASR dialog box for a TRACON with three ASR-9 radars. The black coloring on the button for the ASR-9 named Sachse indicates the presence of operationally significant anomalous propagation (AP) editing of the precipitation data from Sachse.

The ASR dialog box shall contain one (1) button for each ASR-9 associated with the airport. Each ASR-9 button shall be labelled with the name of the radar (adaptation data; Section 3.10.7.3). If the Precipitation with AP Flagged product for an ASR-9 radar contains an operationally significant area of AP, the associated button shall be colored black with white text. If the user clicks on one of the ASR-9 buttons, the SD shall display the associated Precipitation with AP Flagged product. While the product is displayed or if the Precipitation with AP Flagged product for an ASR-9 is unavailable, the corresponding ASR-9 button shall not be selectable and shall be indicated as such.

3.10.7.3 Adaptation Data

The prioritized list of ASR-9 radars shall be field-settable adaptation data set at the SD.

The radar names for ASR dialog box shall be field-settable adaptation data set at the MDT.

3.10.8 Tornado: Detection

3.10.8.1 Description

The SD shall display the Tornado:Detection product in every graphics window. Each tornado shall be indicated by an icon that is a black unfilled circle with a black filled isosceles triangle in the center. The corners of the triangle shall touch the black circle. The 40-degree angle of the triangle shall point in the direction the tornado is moving. There shall be white text in the center of the triangle that indicates with one (1) or two (2) digits the speed of motion of the tornado.

3.10.8.2 User Interaction

3.10.8.2.1 Product Status Button

If the user clicks the right mouse button on the Tornado product status button, the SD shall display a dialog box titled "Tornado". The status lines shall be labelled "Detection" and "Alert".

3.10.9 Wind Shear: Ribbon Display Alerts (Colored Runways and Corridors)

3.10.9.1 Description

The airport associated with the graphics window is defined as the primary airport. Each graphics window shall show the non-directed runways, directed runways, and active corridors for the airport with which it is associated. In addition, each graphics window shall show non-directed runways, directed runways, and active corridors for any other airport associated with the SD and within the same ITWS if and only if the alert product is available for that airport, at least one active ARENA (AREa Noted for Attention) for that airport is alerted, and the airport is within the coverage region of the window. (e.g., While a five (5) nm window might not cover more than one airport, the TRACON range should show all runways for the entire TRACON.)

Except for the display of runways and corridors for airports other than the primary airport, the algorithm used for drawing and coloring the runways and corridors and filling the runway polygons is intended to match the behavior of the TDWR Display Functional Unit (DFU). Runways shall be indicated with polygons. Non-directed runways may have more than four sides. However, directed runways are typically depicted as rectangles. Each approach and departure corridor shall be depicted as a series of line segments with the end of each line segment terminating with a crosshatch. The series of line segments associated with a single corridor will typically form a line that depicts a heading for the associated runway. Each line segment corresponds to a single ARENA. The length of the crosshatches shall equal the width of the shortest side of the directed runway polygon with which they are associated.

When the PG indicates the presence of a wind shear with gain alert on an active ARENA, the SD [shall removed] colors the associated runway and/or corridor Gust Front (GF) Purple. When the PG indicates the presence of a wind shear with loss alert or microburst alert on an active ARENA, the SD [shall removed] colors the associated runway and/or corridor Microburst (MB) Red. Runways and corridors that are not associated with alerted ARENAs [shall removed] are colored black. Only those corridors that are associated with an active runway [shall removed] are displayed. The colors of the runways and corridors shall be as shown in Table 3-14 .

3.10.9.2 User Interaction

3.10.9.2.1 Product Status Button

The operation of the product status button is as described in Section 3.11.2.2.1.

3.10.9.3 Adaptation Data

The runway locations and approach and departure corridors shall be site-specific adaptation data.

Alert Condition and Location of First Encounter	Active			Inactive		
	Directed Region		Non-directed Region (Runway)	Directed Region		Non-directed Region (Runway)
	Runway	Corridor		Runway	Corridor	
No alert associated with the region	black outline[a] no fill	black[a]	black outline[a] no fill	black outline[a] no fill	not shown	black outline[a] no fill
Wind shear with gain on runway ARENA	black outline GF Purple fill	GF Purple	GF Purple outline no fill	black outline[a] no fill	not shown	black outline[a] no fill
Wind shear with loss on runway ARENA	black outline MB Red fill	MB Red	MB Red outline no fill	black outline[a] no fill	not shown	black outline[a] no fill
Wind shear with gain on corridor ARENA	black outline no fill	GF Purple	N/A	black outline[a] no fill	not shown	N/A
Wind shear with loss on corridor ARENA	black outline no fill	MB Red	N/A	black outline[a] no fill	not shown	N/A

Table 3-14. Runway and Corridor Colors

a. Not shown if none of the active ARENAs associated with the region are alerted and the airport is not the primary airport for the graphics window.

3.11 Text Products

Unless otherwise specified, the information in Sections 3.1 through 3.3 and Section 3.5 applies to the display of text products.

3.11.1 Unavailable Text Products

If a Text product becomes unavailable, it shall not be displayed in the associated Text product window.

3.11.2 Wind Shear: Ribbon Display Alerts

3.11.2.1 Description

The Ribbon Display Alerts product provides all alerts for all active runways and active corridors at an ITWS airport.

The SD shall have the capability to display the Ribbon Display Alerts product for each airport associated with the SD. The product shall appear in a separate text product window for each airport. The window title bar shall contain the words "Ribbon Display Alerts" (*e.g.,* "LGA - Ribbon Display Alerts"). The first line of the Wind Shear: Ribbon Display Alerts text product window shall display the name of the runway configuration used to configure the alert information. For the remaining lines in the Wind Shear: Ribbon Display Alerts text product window, the format of the product shall be a line showing the center field wind followed by runway lines with the format of the text the same as that used for the RBDT (Section 6). The tornado warning shall be displayed following the other Ribbon Display messages.

3.11.2.2 User Interaction

3.11.2.2.1 Product Status Button

If the user clicks on the RD Alerts product status button, the SD shall take one of the actions described in Table 3-15, depending upon the current status of the text product window, for the airport in the active graphics window. The color of the product status button shall be as shown in Table 3-16.

Current Window Status	Action
Not Displayed	Window is displayed
Displayed but hidden	Window is moved to front
Displayed and in front	Window is closed
Iconified	Window is opened and moved to front

Table 3-15. Text Product Window User Interaction.

If the user clicks the right mouse button on the RD Alerts product status button, the SD shall display a dialog box titled "Ribbon Display Alerts".

Current Window Status	Product Available	Product Unavailable
Not Displayed	white	red
Displayed but hidden	green	red
Displayed and in front	green	red
Iconified	green	red

Table 3-16. Product Status Button Color for Text Products.

3.11.3 Storm Cell Information

3.11.3.1 Description

In each graphics window, the SD shall allow the display of Storm Cell Information product that is computed based on the precipitation product that is displayed in that window. Thus, there is a different Storm Cell Information product for each precipitation product. Hereafter, the term "product" when used in conjunction with Storm Cell Information product means the Storm Cell Information product based upon the underlying precipitation product.

The SD shall have the ability to display the Storm Cell Information product for storm cells that are in the active graphics window. The product shall be displayed in a text product window. The text product window title bar shall contain the words "Storm Cell Information" (*e.g.,* "DFW - Storm Cell Information").

3.11.3.2 User Interaction

If the active graphics window is in Product Interaction GWI mode and the user clicks the left mouse button in the active graphics window, the SD shall compute which storm cell is closest to the selected location. A text product window adjacent to the active graphics window containing the Storm Cell Information product for the selected storm cell shall be displayed. The SD shall indicate which storm cell is closest to the selected location by drawing a black line (a Storm Cell Information indicator) within the graphics window from the centroid of the storm cell to the nearest edge of the Storm Cell Information text product window if the storm cell is within the display range of the graphics window. The text in the Storm Cell Information text product window and the black line shall redisplay dynamically as the Storm Cell Information product updates and/or the products are panned and/or zoomed.

If the storm cell nearest to the selected location is not within the display range of the graphics window, the SD shall display a message in the Storm Cell Information text product window. The text of the message shall be "Selected storm cell not currently displayed."

If the user attempts to display the Storm Cell Information product and no storm cells have been defined for the product in the active graphics window, the SD shall display a message. The text of the message shall be "No storm cells to select."

The Storm Cell Information text product window shall close if the user does not click on another cell within 30 seconds. If the user does click on another cell, the information in the text box shall be replaced with the Storm Cell Information for the new cell.

If the user makes another graphics window active, the Storm Cell Information text product window shall disappear. There shall be a maximum of one (1) Storm Cell Information text product window on the screen at any time.

If the Storm Cell Information text product window is obscured by another window, clicking the left mouse button in the active graphics window shall bring the Storm Cell Information window to the front and shall display the Storm Cell Information product for the storm cell nearest to the selected location.

3.11.3.2.1 Product Status Button

If the user clicks the right mouse button on the Stm Cell product status button, the SD shall display a dialog box titled "Storm Cell Information".

3.11.4 Terminal Winds: Wind Profile

3.11.4.1 Description

The SD shall have the ability to display the Terminal Winds: Wind Profile product for each ITWS airport associated with the SD. The product shall appear in a separate text product window for each ITWS airport. The window title bar shall contain the airport location code, a hyphen, and the words "Terminal Winds" (*e.g.,* "LGA - Terminal Winds").

The first line of the Terminal Winds: Wind Profile text product window shall display the text "(ALT DIR SPD)" centered in the text product window. The Terminal Winds: Wind Profile product text window shall display a set of wind profiles arranged in an array. Each profile shall have an associated title displayed above it. One or more profile positions may be blank. There shall be one (1) blank line between each row of profiles. There shall be two (2) blank columns between each column of profiles. Each line of the profile shall display altitude, wind direction, and wind speed. An example of what this should look like for a three-by-three profile is shown in Figure 3-19.

A wind direction of less than 100 degrees shall be padded to the left with zeros to contain three (3) characters. The wind speed shall be padded to the left with spaces to contain three (3) characters. If wind speed is less than three (3) knots, the text "CALM" shall replace the wind direction and speed information. If the wind profile altitude data quality indicator indicates that the data are INVALID, the text "999 999" shall replace the wind direction and speed information.

3.11.4.2 User Interaction

3.11.4.2.1 Product Status Button

If the user clicks on the Term Wind product status button, the SD shall take one of the actions described in Table 3-15, depending upon the current status of the text product window, for the airport in the active graphics window. The color of the product status button shall be as shown in Table 3-16.

```
┌─────────────────────────────────────────────────────┐
│                                                       │
│                   Terminal Winds                      │
│                   (ALT DIR SPD)                       │
│                                                       │
│     NW corner          18SD           NE corner       │
│     100 260  15      060 230  20      100 240   23    │
│     060 210  11      050 230  18      060 220   25    │
│                      040 180  15                      │
│                      030 150   12                     │
│                                                       │
│                                                       │
│       18OM                              36OM          │
│     030 150   11                      030 160   13    │
│     020 090    8                      020 CALM        │
│                                                       │
│                                                       │
│     SW corner          36SD           SE corner       │
│     100 260  15      060 230  20      100 240   23    │
│     060 210  11      050 230  18      060 220   25    │
│                      040 180  15                      │
│                      030 150  12                      │
│                                                       │
└─────────────────────────────────────────────────────┘
```

Figure 3-19. Terminal Winds: Wind Profile Product.

If the user clicks the right mouse button on the Term Wind product status button, the SD shall display a dialog box titled "Terminal Winds".

3.11.4.3 Adaptation Data

The profile locations shall be field-settable adaptation data set at the MDT.

The altitudes of interest shall be field-settable adaptation data set at the MDT.

The table format shall be field-settable adaptation data set at the MDT.

3.11.5 Terminal Weather Text Message: Text

3.11.5.1 Description

The SD shall have the ability to display the Terminal Weather Text Message: Text product for each airport associated with the SD. The product shall appear in a separate text product window for each ITWS airport. The window title bar shall contain the airport location code, a hyphen, and the words "Terminal Text" (*e.g.,* "LGA - Terminal Text").

3.11.5.2 User Interaction

3.11.5.2.1 Product Status Button

If the user clicks on the Term Text product status button, the SD shall take one of the actions as described in Table 3-15, depending upon the current status of the text product window, for the airport in the active graphics window. The color of the product status button shall be as shown in Table 3-16.

If the user clicks the right mouse button on the Term Text product status button, the SD shall display a dialog box titled "Terminal Text".

3.11.6 Runway Configuration

The SD shall have the ability to display the Runway Configuration product for each airport associated with the SD. The product shall appear in a separate text product window for each ITWS airport. The window title bar shall contain the airport location code, a hyphen, and the words "Runway Configuration" (*e.g.,* "DFW - Runway Configuration"). An example of a runway configuration text product window is shown in Figure 3-20. The runway configuration text product window shall contain the name of the current runway configuration, the list of active runways, the configuration of runway information on each ribbon display terminal, and the status of the audible alarm for each ribbon display terminal associated with the SD.

Figure 3-20. Runway Configuration Text Product Window

3.11.6.1 User Interaction

3.11.6.1.1 Product Status Button

If the user clicks on the Rwy Config product status button, the SD shall take one of the actions as described in Table 3-15, depending upon the current status of the text product window, for the airport in the active graphics window. The color of the product status button shall be as shown in Table 3-16.

If the user clicks the right mouse button on the Rwy Config product status button, the SD shall display a dialog box titled "Runway Configuration".

3.12 Ribbon Display Terminal Messages

The SD shall send ITWS RBDT messages to the RBDT displays.

The requirements for the RBDT messages in Product Display ITWS Operational Mode will be as given in Section 6.

4 PRODUCT DISPLAY TDWR OPERATIONAL MODE

Basic display requirements, properties, functions, and operations are specified in Section 3, Product Display ITWS Operational Mode. Only requirements specific to Product Display TDWR Operational Mode are detailed here.

4.1 Products Not Fully Supported

All Product Status buttons, except MB, Precip, GF, and RD Alerts, are considered "Not Supported" by the TDWR and shall be Background Gray with no text whatsoever. Clicking any mouse button on Product Status buttons colored Background Gray shall be considered an invalid selection.

The Precip and GF Product Status buttons are partially supported by the TDWR in that only a subset of the products represented by those buttons are provided by the TDWR; the MB and RD Alerts Product Status buttons are fully supported by that system. If any of the individual products associated with a specific Product Status button are "Not Supported" by the TDWR as indicated in Table 4-1, that product will not affect the determination of the color of the Product Status button in accordance with Section 3.8.1.1.

Product Status Button	Product	Supported/Not Supported
MB	MB	Supported
GF	Detections	Supported
	Forecasts	Supported
	Impact	Not Supported
Precip	5 nm	Supported
	TRACON	Supported
	100 nm	Not Supported
	200 nm	Not Supported
RD Alerts	RD Alerts	Supported

Table 4-1. Products Supported by TDWR.

The MBA and WSA Alert buttons and the Tornado, Lightning, Gust Front, and AP Alert boxes shall be Background Gray with no text whatsoever. Clicking any mouse button on those Alert boxes and buttons shall be considered an invalid selection.

4.2 Ribbon Display Terminal Messages

The SD shall send TDWR RBDT messages to the RBDT displays.

The requirements for RBDT messages in Product Display TDWR Operational Mode are as given in Section 6, except that Section 6.1.3 does not apply.

5 PRODUCT DISPLAY LLWAS OPERATIONAL MODE

Basic display requirements, properties, functions, and operations are outlined in Section 3, Product Display ITWS Operational Mode. Only requirements specific to Product Display LLWAS Operational Mode are detailed here.

5.1 Products Not Fully Supported

All Product Status buttons except RD Alerts shall be Background Gray with no text whatsoever. Clicking any mouse button on Product Status buttons colored Background Gray shall be considered an invalid selection.

The MBA and WSA Alert buttons and the Tornado, Lightning, Gust Front, and AP Alert boxes shall be Background Gray with no text whatsoever. Clicking any mouse button on those Alert boxes and buttons shall be considered an invalid selection.

5.2 Ribbon Display Terminal Messages

The SD shall send LLWAS RBDT messages to the RBDT displays.

The requirements for RBDT messages in Product Display LLWAS Operational Mode are as given in Section 6, except that Section 6.1.3 does not apply.

6 RIBBON DISPLAY REQUIREMENTS

6.1 Hazardous Weather Message Display

The ITWS will display alphanumeric microburst, wind shear, and tornado message elements on the RBDT.

6.1.1 Alphanumeric Microburst Representation

The alphanumeric microburst representation requirements may change over time. The alphanumeric microburst message requirements specified in this document are intended to support flexibility in selection of microburst message characteristics.

6.1.1.1 Microburst Message Element Selection

The microburst message elements shall be:

1. Operational Runway Identifier (five (5) alphanumeric characters),
2. Type of Alarm (MBA),
3. Estimated loss (four (4) alphanumeric characters; *e.g.* 40K-),
4. Operational Runway Location (three (3) alphanumeric characters; *e.g.,* 2MF), and
5. Threshold/Boundary winds (three (3) digits for wind direction and two (2) digits for wind speed, *e.g.*, 240 15).

The order of the message elements shall be site-specific adaptation data. The selected message elements shall be included in alphanumeric microburst messages displayed on the RBDT. All alphanumeric microburst alarm messages for runways shall have the same message elements and order. The message elements shall be displayed in fixed column positions as shown in Figure 6-1. This section applies only when the source of the microburst messages is either ITWS or TDWR.

6.1.1.2 Clear Message

An alarm message shall be deleted from the RBDT microburst when the microburst alarm message no longer exists.

6.1.1.3 Numerical Overflow

When microburst messages are from ITWS or TDWR, the ITWS shall control numerical overflow in the alphanumeric microburst alarm messages. A "95" will be indicated as the estimated loss for alphanumeric microburst messages having an estimated loss greater than 95 knots.

6.1.2 Alphanumeric Wind Shear Representation

The alphanumeric wind shear representation requirements may change over time. The alphanumeric wind shear message requirements specified in this document are intended to support flexibility in selection of wind shear characteristics.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	C	F		0	8	0		1	5	G	2	0													
2	2	7	L	A			M	B	A		3	5	K	-		2	M	F		1	9	0		1	5
3	2	7	L	D			2	2	0		2	0													
4																									
5	2	7	R	D			W	S	A		4	0	K	+		1	M	D		1	7	0		2	0
6																									
7																									
8																									
9																									
10	T	O	R	N	A	D	O		W	S	W		S	W											

Figure 6-1. Examples of alphanumeric messages on the RBDT.

6.1.2.1 Wind Shear Message Element Selection

The wind shear message elements shall be:

1. Operational Runway Identifier (five (5) alphanumeric characters),
2. Type of Alarm (WSA),
3. Estimated Gain or Loss (four (4) alphanumeric characters; *e.g.* 40K+),
4. Operational Runway Locations (three (3) alphanumeric characters; *e.g.,* 2MF), and
5. Threshold/Boundary Winds (three (3) digits for wind direction and two (2) digits for wind speed, *e.g.*, 240 15).

The order of the message elements shall be site-specific adaptation data. The selected message elements shall be included in alphanumeric wind shear messages displayed on the RBDT. All alphanumeric wind shear alarm messages for runways shall have the same message elements and order. The message elements shall be displayed in fixed column positions as shown in Figure 6-1. This section applies only when the source of the wind shear messages is either ITWS or TDWR.

6.1.2.2 Clear Message

A wind shear alarm message shall be deleted from the RBDT display when the wind shear alarm message no longer exists.

6.1.2.3 Numerical Overflow

When wind shear messages are from ITWS or TDWR, the ITWS shall control numerical overflow in the alphanumeric wind shear alarm messages. A "95" will be indicated as the estimated gain or loss for alphanumeric wind shear alarm messages having an estimated gain or loss of greater than 95 knots.

6.1.3 Alphanumeric Tornado Representation

The alphanumeric representation requirements may change over time. The alphanumeric tornado message requirements specified in this document are intended to support flexibility in selection of tornado message characteristics.

6.1.3.1 Tornado Message Element Selection

The tornado message elements shall be:

1. Type of alarm (TORNADO), and
2. Directions to tornado detections (up to 18 alphabetic characters including spaces between directions, *e.g.* WNW SW).

The order of the message elements shall be site-specific adaptation data. The location of the tornado message shall be field-settable adaptation data set at the MDT. The default location shall be at the bottom of the RBDT. An example of the tornado message is shown in Figure 6-1.

6.1.3.2 Clear Message

A tornado alarm message shall be deleted from the RBDT display when the tornado alarm message no longer exists.

6.1.3.3 Tornado Message Precedence

When present, the tornado message shall take precedence over all RBDT messages (Section 6.2.3).

6.2 Other Ribbon Display Terminal Message Displays

6.2.1 Non-alarm Runway Message Display

The ITWS shall display alphanumeric runway message elements on the RBDT as alphanumeric text messages for each active runway selected for display whenever a microburst or wind shear alarm message is not in effect for that runway.

6.2.2 Alphanumeric Runway Message Elements

The alphanumeric runway message requirements may change over time. The alphanumeric runway message requirements specified in this document are intended to support flexibility in the selection of non-alarm runway message characteristics.

6.2.2.1 Runway Message Element Section

The non-alarm message elements shall be:

1. Operational Runway Identifier (five (5) alphanumeric characters), and
2. Threshold/Boundary Winds (three (3) digits for wind direction and two (2) digits for wind speed, *e.g.*, 240 15).

The order of the message elements shall be site-specific adaptation data. The selected elements shall be included in alphanumeric runway messages displayed on the RBDT. All alphanumeric runway message elements shall have the same message elements and order. The message elements shall be displayed in fixed column positions as shown in Figure 6-1. This section applies only when the source of the messages is either ITWS or TDWR.

6.2.2.2 Threshold/Boundary Wind Element Display

If the threshold /boundary wind element is not provided, the RBDT shall not display any text in the threshold/boundary wind field of the runway message.

6.2.3 Status Message

If the Centerfield Wind Message Element is displayed on the top line of the RBDT, a status message shall be displayed on the bottom line of the RBDT. If the Centerfield Wind Message Element is displayed on the bottom line of the RBDT, a status message shall be displayed on the top line of the RBDT. The status message elements shall be:

1. the System Status Element (SSE; 21 alphabetic characters, *e.g.*, COMMUNICATION FAILURE), and
2. Audible Alarm State (seven (7) alphabetic characters; ALM ON or ALM OFF).

The status message elements shall be displayed in fixed column positions. Examples of the status message are provided in Figure 6-2.

Figure 6-2. Examples of status messages on the RBDT.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	C	O	M	M	U	N	I	C	A	T	I	O	N		F	A	I	L	U	R	E				
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10	P	L	A	Y	B	A	C	K											A	L	M		O	F	F

The SSE [shall removed] is one of:

1. COMMUNICATION FAILURE,
2. MAINTENANCE, or
3. PLAYBACK

The contents of the status message are dependent upon the SD Product Display Operational Mode (PDOM) for the airport associated with the RBDT, the mode of the ITWS PG (if the SD PDOM is ITWS), and availability of the data that are displayed on the RBDT. The data that are displayed on the RBDT will hereafter be referred to collectively as RBDT products. RBDT products consist of center field wind, Ribbon Display Alert messages, and Tornado Warning messages. (The term RBDT products as used in FAA-E-2900 consists only of Ribbon Display Alert messages.)

Depending upon the SD PDOM for the airport associated with the RBDT and the hardware configuration of the SD, there may be one or more possible sources of RBDT products: ITWS, TDWR, and LLWAS. When the SD PDOM for the airport associated with the RBDT is ITWS, ITWS is the primary source of RBDT products; TDWR and LLWAS are considered to be backup data sources. Non-ITWS SD PDOMs and backup data sources are not supported on all SDs. FAA-E-2900 details the rules governing the support for TDWR and LLWAS data sources. FAA-E-2900 also details the rules governing the determination of the source of Ribbon Display Alert messages when more than one data source is supported at an SD. The center field wind information is taken from the data source providing the Ribbon Display Alert messages. Availability of the center field wind information is linked to the availability of the Ribbon Display Alert message from the selected data source. Tornado Warning messages are provided only by ITWS.

In the requirements that follow, the phrase "no RBDT products available to the SD" is used to denote that the center field wind, Ribbon Display Alert messages, and Tornado Warning messages are all unavailable for display on the RBDT. The availability of the RBDT products to the SD is determined based on the SD PDOM for the airport associated with the RBDT and the application of the FAA-E-2900 rules for selection of the data source.

The SSE shall be COMMUNICATION FAILURE if there are no RBDT products available to the SD for the airport associated with the RBDT and either

- the SD is not in a mode to perform a playback of archived products and

- the SD PDOM for the airport associated with the RBDT is TDWR or LLWAS

or

- the SD is not in a mode to perform a playback of archived products and

- the SD PDOM for the airport associated with the RBDT is ITWS and

- the ITWS PG for that airport is in a mode to produce live operational products.

The SSE shall be MAINTENANCE if

- the SD is not in a mode to perform a playback of archived products and

- the SD PDOM for the airport associated with the RBDT is ITWS and

- the ITWS PG for that airport is in a mode to perform maintenance.

The SSE shall be PLAYBACK if

- the SD is in a mode to perform a playback of archived products or

- the SD PDOM for the airport associated with the RBDT is ITWS and the ITWS PG for that airport is in a mode to perform a playback from recorded data.

If there are no RBDT products available to the SD for the airport associated with the RBDT, all RBDT messages except the SSE shall be deleted from the RBDT. That is, the Audible Alarm State, Center Field Wind Message Element, Runway Message Elements, Microburst Message Elements, Wind Shear Message Elements, and Tornado Message Element are deleted from the RBDT.

The SSE shall be deleted from the RBDT if the criteria are not met for setting the SSE to COMMUNICATION FAILURE, MAINTENANCE, or PLAYBACK

If the SD PDOM is ITWS and the tornado message is located on the same line as the status message and there is a tornado alarm, the Tornado Warning message shall alternate (or time-share) with the status message (SSE and Audible Alarm State) until the tornado alarm no longer exists (Section 6.1.3.2). The time-share interval shall be 5 seconds. When the tornado message is located on a line that is used for the Center Field Wind Message Element or an Alphanumeric Runway Message, the Tornado Warning message takes precedence as specified in Section 6.1.3.3.

Under certain conditions a MBA/WSA OTS message is displayed on the RBDT. When MBA/WSA OTS is displayed, the eight (8) lines of the RBDT that can contain Runway Message Elements, Microburst Message Elements, and Wind Shear Message Elements shall contain the text MBA/WSA OTS. MBA/WSA OTS is not a SSE and is not displayed on the status message line or the Center Field Wind Message Element line. The display of MBA/WSA OTS does not affect the SSE. MBA/WSA OTS shall be displayed if

- the SD PDOM for the airport associated with the RBDT is ITWS and

- Ribbon Display Alert messages are not available to the SD from any of the RBDT data sources (see also FAA-E-2900) and

- Tornado Warning messages are available from the ITWS PG.

This section does not levy requirements on the response of the RBDT device to a loss of communication between it and the SD.

6.2.4 Center Field Wind Message Element

The center field wind message element will be described by the Characters "CF ddd ssGgg" to indicate center field wind direction, wind speed, and gust wind speed. When the center field wind speed is greater than or equal to three (3) knots, the center field wind message shall be composed of the letters "CF"; a space; three digits "ddd" indicating center field wind direction in degrees with ten (10) degree resolution and a range from ten to three hundred-sixty (010 - 360) degrees; a space; two (2) digits "ss" indicating center field wind speed in knots with one (1) knot resolution and a range from three to ninety-nine (03 - 99) knots, rounded to the nearest knot; and, if the gust speed is greater than or equal to three (3) knots, the letter "G" and two decimal digits "gg"

indicating the center field wind gust speed in knots with one (1) knot resolution and a range from three to ninety-nine (03 - 99) knots, rounded to the nearest knot. When the center field wind speed is less than three (3) knots, the center field wind message shall be composed of the letters "CF", a space, and the letters "CALM". The center field wind message shall display 9's for direction (ddd), speed (ss), and gust speed (gg) when center field wind data are unavailable [*i.e.*, "CF 999 99G99"].

The Center Field Wind Message Element shall appear on the top or bottom line (field-settable adaptation data set at the MDT) of the RBDT.

6.3 Ribbon Display Terminal Alarms

6.3.1 Ribbon Display Terminal Audible Alarm

An audible alarm shall be generated at an RBDT upon the display of a hazardous weather alphanumeric alarm message, only if the display previously contained no alarm message(s). The audible alarm shall stop sounding when acknowledged by the operator at the RBDT, or upon expiration of the Alphanumeric Alarm Period.

For the purposes of sounding the blanking alarm, the following conditions are treated as blanking:

1. display of MBA/WSA OTS and
2. deletion of all RBDT messages except the SSE.

6.3.2 Ribbon Display Terminal Visual Alarm

Alphanumeric hazardous weather alarm message(s) (Section 6.1) shall be indicated by flashing the text, or part of the text, on the ribbon display status line, only if the display previously contained no alarm message(s). Alphanumeric text shall stop flashing when acknowledged by the operator, or upon expiration of the Alphanumeric Alarm Period. A field-settable adaptation data Alphanumeric Alarm Period with one (1) second resolution, a range from 5 to 300 seconds, and a default value of five (5) seconds shall be provided. Once acknowledgment of any visual alarm has been made or upon expiration of the Alphanumeric Alarm Period, the status text shall be displayed not flashing on successive product updates.

The user shall be able to disable the visual alarm via field-settable adaptation data set at the MDT.

Appendix A. Numerical Display

Section	Type	Max # Places	Left Padding
3.3.2.2	Range	3	None
3.4.3.6	Range	3	None
3.4.3.7.2	Range Ring Label	3	None
3.4.3.8.1	Precipitation Levels	1	None
3.6	Year	4	None
	Month	2	Zero
	Day	2	Zero
	Hour	2	Zero
	Minutes	2	Zero
	Seconds	2	Zero
3.7.1.2	Qwerty Keyboard	1	None
3.7.3.1	Date & Time in UTC	same as above	Zero
3.7.4.3	Embedded in Names		Zero for date, time, runway designator; None otherwise
3.7.4.4	Runway Designator	2	Zero
3.9.2.1	MBA ATIS Timer	2	Space
3.9.3.1	WSA ATIS Timer	2	Space
3.9.4.1	Tornado Alert Radius	2	Space
3.9.5.1	GF Impact Timer	2	Space
3.9.6.1	Airport Lightning	2	Space
3.10.2	Precip Product Names	3	None
3.10.2.3.1	Precipitation Levels	1	None
3.10.3.1.1	Storm Motion speed	3	None
3.10.3	SEP/SM Prod Names	3	None
3.10.4.1	MB Loss Values	2	N/A
3.10.6.1	GF Wind Shift Speed	2	None

Section	Type	Max # Places	Left Padding
3.10.8.1	Tornado Speed	2	None
3.11.2.1 6.1 6.2	RD Alerts elements:		
	Runway Designator	2	Zero
	MB Loss	2	N/A
	Wind Speed	2	Zero
	Wind Direction	3	Zero
	Wind Shear Gain and Loss	2	N/A
	CF Wind Speed	2	Zero
	CF Wind Direction	3	Zero
	CF Wind Gust	2	Zero
3.11.4.1	Terminal Winds:		
	Wind Speed	3	Spaces
	Wind Direction	3	Zero
	Altitude	3	Zero
3.11.6.1	Runway Designator	2	Zero

Appendix B. Colors, Fonts, and Dimensions

	R	G	B
No Data Gray	75	75	75
Background Gray	161	161	161
Range Rings	0	0	255
Gust Front Purple	150	0	200
Microburst Red	240	10	10
Level 1 Precipitation	160	240	0
Level 2 Precipitation	96	176	0
Level 3 Precipitation	240	240	0
Level 4 Precipitation	240	192	0
Level 5 Precipitation	224	144	0
Level 6 Precipitation	160	0	0
TDWR Attenuation Gray	28	28	28
AP, Overlays, Text	0	0	0
Lightning Yellow	255	255	0
cyan	0	255	255
green	0	255	0
red	255	0	0
white	255	255	255
yellow	242	242	0
black	0	0	0

Table B-1. RGB Values for ITWS SD.

NOTE: This appendix assumes a color table with a range of zero to 255. These colors should be scaled appropriately based upon the number of available colors.

Feature	Font
Display Configuration Buttons	Font #1
Product Status Buttons	Font #7
Alert Panel: One-Airport Case	
"MBA" and "WSA" text	Font # 2
MBA and WSA Timers: Timer Value	Font # 3
Manual/Automatic Indicator Text	Font #9
Others	Font #7
Alert Panel: Multiple Airport Case	Font #7
Dialog Boxes	
Headings	Font # 4
Labels in Boxes	Font #1
Buttons	Font #1
Status Text	Font #4
Microburst Loss Value[a]	
Smallest	Font #5A
Largest	Font #5Z
Storm Motion: Speed Estimate	Font # 6
Gust Front Wind Shift: Speed Estimate	Font # 6
Tornado: Speed Estimate	Font # 6
Playback/Maintenance Text	Font #8
System Status/Info Window Text	Font #10
Text Product Windows	
Headings	Font #4
Data	Font #11

Table B-2. ITWS SD Fonts.

a. The font used for the microburst loss value should be scaled, ranging from the smallest to the largest font, appropriate to the size of the microburst or wind shear shape.

Notes on using the font strings:

The font strings provided below for design guidance are those used in a prototype version of the ITWS display. The fonts are defined for a screen with a pixel resolution of 100 dpi x 100 dpi and a screen resolution of 1280 x 1024 pixels. Differences in the pixel resolution, font appearance, and font selection on a particular platform may require some adjustments in the fonts actually used.

Although adobe is the foundry used in all of the font strings listed, the identity of the foundry should be adjusted based on the fonts available on the display machine. For example, on some machines it will be necessary to use linotype as the foundry instead of adobe for the narrow helvetica fonts.

Some fonts that are implemented as fixed fonts by adobe are implemented as scalable fonts by other foundries (e.g., linotype). In those cases, it will be necessary to replace the values of the pixel-size and/or average-width fields with 0 in the relevant font strings. For example, in font #4 "19-140-100-100-p-88" would be replaced with "0-140-100-100-p-0" for a scalable linotype font.

Font # 1: -adobe-helvetica-medium-r-narrow--17-120-100-100-p-69-iso8859-1

Font # 2: -adobe-helvetica-bold-r-normal--34-240-100-100-p-182-iso8859-1

Font # 3: -adobe-helvetica-bold-r-normal--0-360-100-100-p-0-iso8859-1

Font # 4: -adobe-helvetica-bold-r-narrow--19-140-100-100-p-88-iso8859-1

Font #5A: -adobe-courier-bold-r-normal--11-80-100-100-m-60-iso8859-1

Font #5Z: -adobe-courier-bold-r-normal--25-180-100-100-m-150-iso8859-1

Font #6: -adobe-courier-bold-r-normal--20-140-100-100-m-110-iso8859-1

Font #7: -adobe-helvetica-bold-r-narrow--0-110-100-100-p-0-iso8859-1

Font # 8: -adobe-helvetica-bold-r-normal--20-140-100-100-p-105-iso8859-1

Font #9: -adobe-helvetica-bold-r-narrow--0-90-100-100-p-0-iso8859-1

Font #10: -adobe-courier-bold-r-normal--0-110-100-100-m-0-iso8859-1

Font #11: -adobe-courier-bold-r-normal--20-140-100-100-m-110-iso8859-1

Feature	Thickness or Width	Length	Other
Extrapolated Position Lines	3 pixels		
Storm Motion Arrows	3 pixels	45 pixels	head triangle - height: 9 base: 10
Wind Shear Shapes	3 pixels		
Gust Fronts	3 pixels		
Wind Shift	Same as Storm Motion Arrows		
Tornado Icon Circle	3 pixels		24 pixel radius
Tornado Icon Triangle			70-70-40 isosceles triangle
Runway Boxes	2 pixels		
Runway Corridors	2 pixels		
Normal Overlay Lines (e.g., county boundary)	1 pixel		
Bold Overlay Lines (e.g., state boundary)	2 or 3 pixels		
Storm Cell Information Indicator	2 pixels		
Hazardous Sector Overlay Lines	3 pixels		

Table B-3. Other SD Dimensions.

Note: This appendix assumes a screen resolution of 1280 x 1024 pixels. If the resolution of the SD differs from this assumption, fonts and sizes should be scaled accordingly.

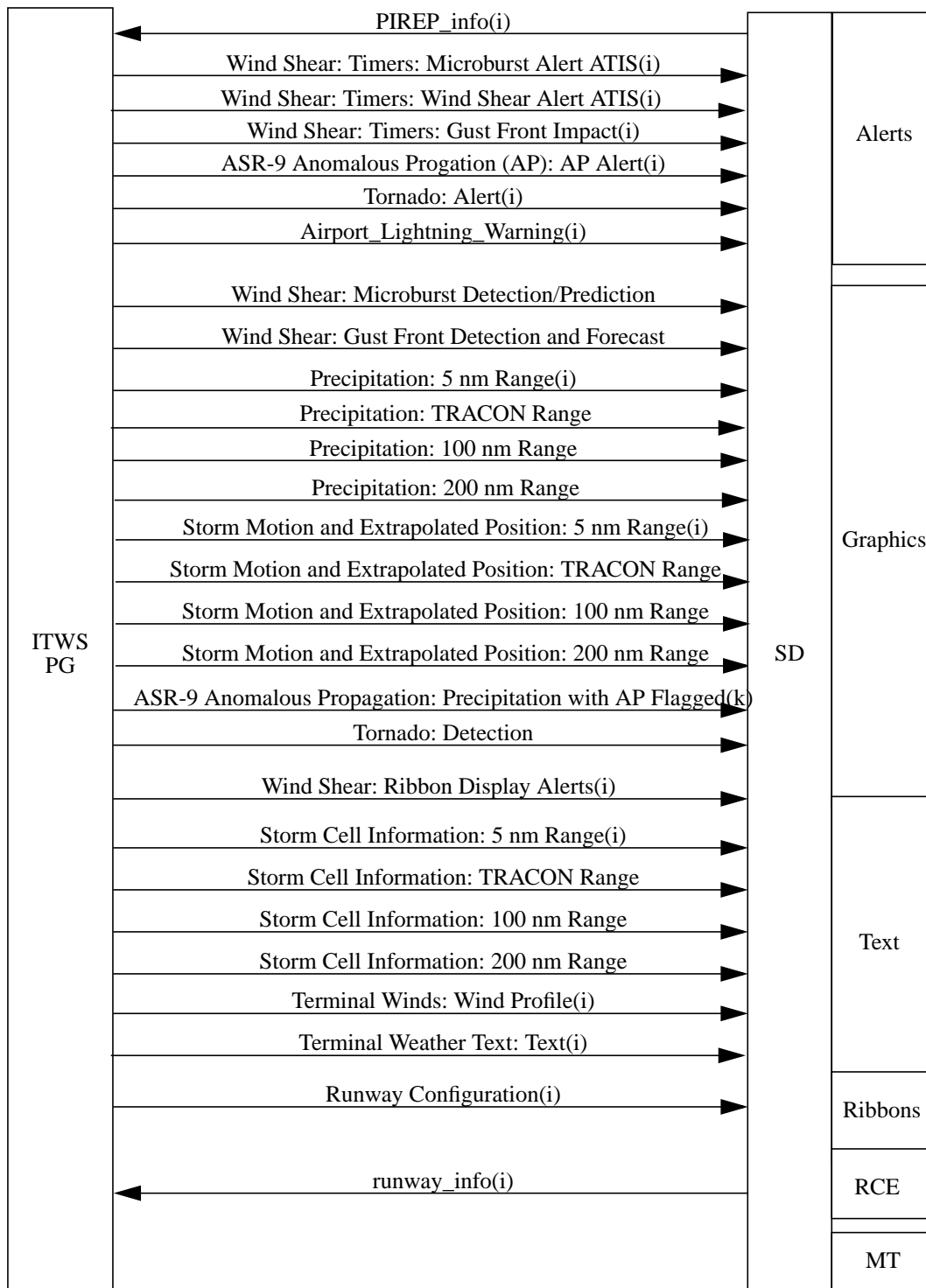# Appendix C.

C.1 Data inputs and outputs

Figure C-1. Overview of data inputs and outputs

C.2 Correlation between labels and ITWS products

The associations among the labels use on the display graphical user interface and the products produced by ITWS are summarized in Table C-1.

Product Status Button	Dialog Box Title	State Labels	Status Labels	ITWS Product Names
MB	Microburst	MB	Status	Wind Shear: Microburst Detection/Prediction

Precip	Precipitation	1-6
		3-6
		4-6
		5-6
		None
			5 nm
			TRACON
			100 nm
			200 nm
				Precipitation:
				    5 nm Range
				    TRACON Range
				    100 nm Range
				    200 nm Range

Stm ExP	Stm ExP	Stm ExP	5 nm
			TRACON
			100 nm
			200 nm
				Storm Motion and Extrapolated Position:
				    5 nm Range
				    TRACON Range
				    100 nm Range
				    200 nm Range

Stm Mot	Stm Mot	Stm Mot	5 nm
			TRACON
			100 nm
			200 nm
				Storm Motion and Extrapolated Position:
				    5 nm Range
				    TRACON Range
				    100 nm Range
				    200 nm Range

Table C-1. Association between GUI labels and ITWS products

Product Status Button	Dialog Box Title	State Labels	Status Labels	ITWS Product Names

Stm Cell	Storm Cell Information	none	5 nm
			TRACON
			100 nm
			200 nm
				Storm Cell Information:
				   5 nm Range
				   TRACON Range
				   100 nm Range
				   200 nm Range

Tornado	Tornado	none	Detection Alert	Tornado: Detection Tornado: Alert

ATIS	ATIS	none	Microburst Alert
			Wind Shear Alert
				Wind Shear: Timers:
				   Microburst Alert ATIS
				   Wind Shear Alert ATIS

GF	Gust Front	Forecasts	Detection and Forecast
			Impact
			Wind Shift Estimate
				Wind Shear:
				   Gust Front Detection and Forecast
				   Timers: Gust Front Impact
				Gust Front Wind Shift Estimate

ASR	ASR	one for each ASR	AP Alert
			one for each ASR
				ASR-9 Anomalous Propagation (AP):
				   AP Alert
				   Precipitation with AP Flagged

RD Alerts	Ribbon Display Alerts	none	Status	Wind Shear: Ribbon Display Alerts
Term Text	Terminal Text	none	Status	Terminal Weather Text Message: Text
Term Wind	Terminal Winds	none	Status	Terminal Winds: Wind Profile
Lightning	Lightning	none	Status	Airport Lightning Warning
Rwy Config	Runway Configuration	none	Status	Runway Configuration

Table C-1. Association between GUI labels and ITWS products

Appendix D.
Descriptive Text for SD Dialog Boxes.

Dialog Box	Descriptive Text
Dialog Boxes Associated with the Display Configuration Section	
Window	No text
New Window	"Select Type" for single-airport case; "Select Type and Airport" for multiple-airport case
Save Window Configuration	"Save As (use the buttons above to enter a name):"
Confirm (save window config)	"Saving this window configuration will overwrite an existing configuration. Do you really want to overwrite?"
Remove Window Configuration	"Select One or More"
Confirm (remove window config)	"You have picked <number> window configurations for deletion. Should those files be deleted now?"
Restore Window Configuration	No text
Screen Image	No text
Print Image	"Select One or More"
Delete Image	"Select One or More"
Confirm (delete image)	"You have picked <number> image files for deletion. Should those files be deleted now?"
Configure Airport	No text
Install Runway Configuration	"Install One OR Select View"
Confirm (runway installation)	"This SD does not currently control the runway configuration for <airport>. Runway configuration is controlled by <controlling SD>. Do you still want to take control and install a runway configuration?"
Runway Configuration Viewer	No text
Dialog Boxes Associated with the Product Status Buttons	
Microburst	No text
Precipitation	No text
Stm ExP	No text

Dialog Box	Descriptive Text
StmMot/StmExP	"Select One or More" in both Automatic Selections and User Selections sections
Stm Mot	No text
Storm Cell Information	No text
Tornado	No text
ATIS	No text
Gust Front	No text
ASR	No text
Ribbon Display Alerts	No text
Terminal Text	No text
Terminal Winds	No text
Lightning	No text
Runway Configuration	No text
Dialog Boxes Associated with the Alerts Products Section	
Product Display Operational Mode (PDOM)	No text
Confirm (change PDOM; Automatic Mode Transition off)	"Do you really want to change the Product Display Operational Mode for <airport> to <display mode>?"
Confirm (no change to PDOM, Automatic Mode Transition off)	"Do you really want to force the Product Display Operational Mode to remain in <display mode> mode for <airport>?"
Confirm (Automatic Mode Transition on)	"Do you really want the Product Display Operational Mode to change automatically for <airport>?"
Confirm (MBA ATIS submit)	"Do you really want to Submit a Microburst PIREP for <airport>?"
Confirm (MBA ATIS withdraw)	"Do you really want to Withdraw a Microburst PIREP for <airport>?"
Confirm (WSA ATIS submit)	"Do you really want to Submit a Wind Shear PIREP for <airport>?"
Confirm (WSA ATIS withdraw)	"Do you really want to Withdraw a Wind Shear PIREP for <airport>?"

Dialog Box	Descriptive Text
Dialog Boxes Associated with the Graphics Windows	
Range	No text
Overlay	"Select One or More"